ELECTRICAL REVIEW

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Things That Matter

Post-War Planning Suggestions

BY not attempting too much the I.E.E. Post-War Planning Committee is the more likely to achieve the purpose of the report (reviewed in our last issue) of its sub-committee dealing with electricity supply, distribution and installation. This is restricted to matters about which electrical engineers are alone competent to express authoritative views. Standardisation of distribution voltages and of form of tariff (not of price), supply availability (in which rural electrification figures prominently) and installation work—these are all items in which improvement is generally agreed to be necessary. Probably any differences of opinion will be lessened after study of the data here brought together and, from long-term considerations, will seem of small moment in comparison with the harm done by the present state of drift.

Removal of Irritants

Although commendable headway has been made of recent years towards the removal of two irritants to users of electricity—the vagaries of voltages and tariffs as between one area and another—the pace has manifestly been too slow to prevent dissatisfaction. Moreover, the longer the delay in facing up to the voltage situation, the greater becomes the cost that will inevitably be incurred; hence the importance of the recommendation that the change-over should be completed nationally within five years of the end of the war.

The suggestion that the few undertakings which have not yet adopted a two-part tariff should be required to do so is surely more in accord with present developments than the existing statutory provision that all undertakings should offer a flat rate as an alternative. The simplest way of resolving the difficulties due to the latter and to the need to decide between the claims of the several good bases for the primary charge would appear to lie in the choice of the variable-block tariff as standard, the balance in its favour being decided by its greater intelligibility to consumers.

Rural Difficulties

Obstacles to full electrification of the countryside are not confined to the impracticability of supplying isolated farmsteads on economic terms. For example, a tenant in England is not encouraged to spend money on an adequate installation, for which he can expect no compensation from his landlord; Scots law, as the sub-committee points out, is more favourable. Nor can a farmer often afford to pay outright for wiring and apparatus and some financial assistance should be made available to him. Among the present anomalies referred to is the position regarding compulsory wayleaves, and it is asked that the Minister responsible should be empowered to fix rental and compensation when he gives permission for a line to be erected.

Attention was drawn in our leader section last week to the principal features of the proposals relating to installation

work. Any controversy here will probably centre on the decision not to advocate an obligatory code of regulations, but this is not so urgent a question as others, since the number of electrical accidents is so minute a percentage of the total and caution is justified in the circumstances. Stricter compliance with the Electricity Commissioners' regulation regarding inspection by undertakings of consumers' installations would no doubt do much to raise standards. Although the sub-committee has kept aloof from political aspects, these bear indirectly on its recommendations. If effect could have been given to these improvements in the past, there would have been few grounds for argument that there was need for drastic reorganisation.

Agreed Proposals

THE joint memorandum on electricity distribution, which was reviewed last week, is now before the undertakings represented on the committee which prepared it. In presenting the memorandum at a Press gathering on February 2nd, Mr. F. Newey, who was chairman of the responsible committee, referred to this and said that they expected 100 per cent. support for the proposals—and would probably get 99 per cent. Each of the associations was at liberty to produce a supplementary memorandum on points not covered in the main document, but the latter represented a very considerable measure of agreement. (A separate memorandum prepared by the I.M.E.A. is reviewed in this issue.) Consequently the Minister of Fuel and Power, who would probably receive the report some time next month, would be bound to regard it as the expression of the views of the industry for which he had asked.

Power Station Efficiency

THERMAL efficiency as a criterion of power station performance, though it has done much to lower generating costs, falls short of the ideal in two ways. It allows insufficient credit to stations that are worked as nearly as practicable up to the limits set by such features as steam conditions, condensing water temperatures and plant load factors. It also takes little account of plant reliability. The attempt made by Messrs. R. W. Biles and G. W. Maxfield in their I.E.E. paper to combine the first (operating efficiency) with the second (availability efficiency) to form a standard of merit is a valuable piece of work. It met with some criticism, but the favourable testimony given during the discussion by station engineers who had tried it was mpressive.

Plant Availability

THE link between operating and availability efficiency is in the test it provides of the all-important maintenance organisation. Not only does liability to breakdown send up the standing charges on spares but it also means the transference of load to usually less economical units. The itemised data presented in the paper and the method devised for using it provides a notable example of a profitable pooling of experience, which should be of great assistance to designers of components as well as to station engineers in enabling them to keep a running record of the performance of their plant. Extended investigations in other areas with a view to confirming or modifying the authors' conclusions should be well worth while.

Low Down

IN the February *Wireless World* "Free Grid" complains about the fitting of electrical outlets to skirting boards. He says that his "lumbar regions and those of thousands of other patriotic citizens have been put to severe strain by the necessity of this constant jack-in-the-box bobbing up and down." It is awkward, of course, but in this position plugs and flexes are not so obvious; it would certainly be more convenient to mount them higher up the wall if it were not for this consideration. But anyway "Free Grid" shouldn't fidget with his plugs. It must be disturbing to have him doing his jack-in-the-box act. This matter is also raised by a correspondent in this issue.

Vacation Apprentices

FROM the discussion on vacation work reported in this issue, the consensus of experienced opinion indicates that these interludes in academic studies should be carefully planned to give the student a pre-view of industry, by which he is enabled to relate theory to practice and absorb the "atmosphere" of the shops. While the insight thus gained ought to be reasonably comprehensive, it should not be superficial. It is better to spend the time on real work in a few sections than in watching what others do while flitting from department

to department. The opportunity thus afforded of enlarging outlook should not be regarded in any way as a substitute for the usual apprenticeship later.

Only Lighting?

LORD WOOLTON, the Minister of Reconstruction, expressed a deplorably nineteenth - century point of view at last week's luncheon of the Parliamentary and Scientific Committee. Speaking of electricity, he said: "In any plan for the post-war world we expect to make great strides to ensure that this form of illumination will be generally available. I hope that we shall see it on the farm as in the factory, in the cottage as in the villa." We cannot believe that he thinks it economically possible to extend distribution systems just to supply a couple of 40-W lamps in a few cottages. Shall we never live down our reputation for the best lighting?

Electricity in Agriculture

IN this country the importance to the agricultural industry of a supply of electric power is being stressed. In Argentina the Government has gone so far as to set up as a dependency of the Ministry of Agriculture a National Department of Power which will supervise the production, distribution and consumption of all kinds of fuel.

Telephony in Czecho-Slovakia

RECENT progress in communications being of greatest significance in connection with transmission over long distances, the subject was especially appropriate for the lecture delivered by the I.E.E. President to Czecho-Slovakian engineers last Friday evening. As Sir Stanley Angwin pointed out, the geographical situation of their country in the centre of Europe will make it a most important link in international telephony and developments will no doubt be facilitated by the advanced state of technique there before the war.

Grading

WHILE the question of grading employees according to their skill and experience is under discussion in the engineering industry generally, the matter has been raised in the electrical contracting industry. At a regional conference of the E.C.A. it was considered wrong that one man with sufficient ability to carry out domestic wiring and another who was actually a skilled electrical engineer should be classed together as "operatives" and given the same pay. Surely in such circumstances the "electrical engineer" could be given a better job—say as charge-hand or supervisor, but perhaps that is not always so easy as it might seem.

Easy Money

THERE is a classic story in E.C.A. chronicles of an electrical contractor who died worth £10,000. This was attributed to his ability and many years of hard work, and to the fact that just before his death an aunt had left him £9,999. But apparently there are other ways of acquiring wealth in the contracting industry (if only temporarily). It is reported that a youth carrying out repairs to an installation discovered beneath a floor a hoard of over £1,500 in coin and notes, and a box packed with gold watches and jewellery.

I.E.E. Honours

THE presentation of the Faraday Medal to Dr. Irving Langmuir is not only a tribute to that eminent scientist's important contributions to the electrical art, it is symbolic of the general desire that the English-speaking nations shall be closer neighbours in all fields of activity. That desire extends to the Dominions and it is therefore appropriate that a leading member of the Australian Commonwealth should have the honorary membership of the Institution bestowed upon him. Both Sir Ernest Fisk and Dr. Langmuir have been active in the radio world, the one notably on the development and business side and the other in research.

"National Engineering School"

BIRMINGHAM seeks first place in the technical education sphere. Dr. Raymond Priestley, the Vice - Chancellor, says in a report to the governors of the University that the University should aim at becoming the engineering school of the nation. No other university in Great Britain is a more natural centre for technological research and engineering education. The University asked for £250,000 for new buildings and equipment for the electrical and mechanical engineering departments and later help would be asked for in re-equipping the departments of civil engineering and mining.

Firing China Glost

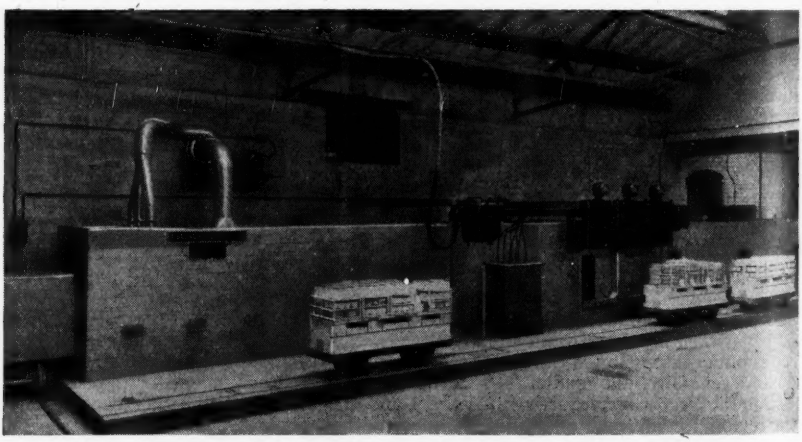
Growing Interest in Electrical Methods

WITH an eye to post-war business many pottery firms are showing an increasing interest in electrical methods. Last March we described a new installation specially constructed for the firing of china glost. To-day details are given of another type of continuous tunnel kiln intended for the same purpose but of quite different design. The kiln was constructed by G.W.B. Electric Furnaces, Ltd., for George Jones & Sons, Ltd., Crescent Works, Stoke-on-Trent, in 1939, as part of a general scheme of modernisation and electrification (to which, unfortunately, the war has put a stop). It is actually a development of a smaller more or less experimental unit installed at the same works in the previous year. Originally this smaller unit, 45 ft. long, was intended for "hard kiln fire" operating at around 820 deg. C., but trials both on the company's own products and those of other manufacturers showed the practicability of raising the temperature to about 1,100 deg. C. and extending the use of plant to deal with china glost.

The larger kiln, built as a result of these experiments, is intended specifically for firing china glost, though it has been employed for earthenware glost, for which, incidentally, it is proposed to install a larger output kiln as soon as circumstances permit. The existing kiln is 75 ft. long and accommodates seventeen trucks 4 ft. 6 in. long by 1 ft. 8 in. wide with a loading height of 1 ft. 6 in. Each of these trucks has 9¾ cu. ft. of placing space and a gross load of 18½–25 doz. pieces of ware, depending on the size of the pieces.

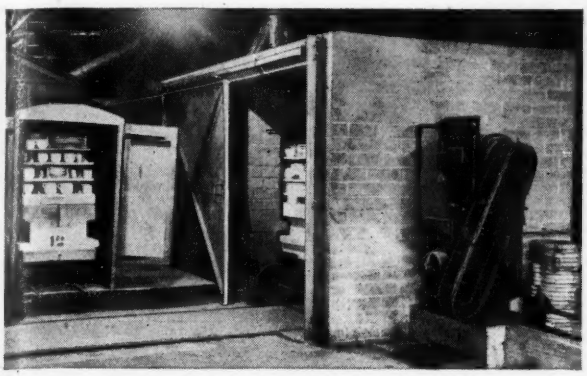
To keep the ware clean the trucks are kept in an enclosed tunnel while awaiting their turn in the kiln. A transfer mechanism is used to introduce them into the kiln and an electrically driven pushing gear (with a 1-HP Crompton Parkinson motor and "Auto Memota" push-button starter) is geared so as to move the trucks in the kiln at the rate of one truck-length in about 85 minutes, though this time is variable to suit different types of pottery. Warning bells ("Tangent") operate either when a truck arrives at the exit door, or when the pushing device has reached its limit, when it stops automatically and has to be wound back by hand. The whole process takes about 23 hours and, operating as it does continuously, the kiln has a weekly output of 2,200 doz. pieces of ware (tea, breakfast, coffee and dinner). On utility ware the output figure can be raised to about 2,900 dozen a week.

Specially graded insulating walls and roof utilised for the kiln structure give exceptionally low heat losses. Seventy-two heating elements, each loaded at 1,200 W, are arranged in pairs, in eight banks (four each side) along the side walls rather more than half-way along the kiln so that the end of the maximum temperature zone occurs about 45 ft. from the entrance. The elements, which are made



The small experimental tunnel kiln from which the kiln specifically designed for dealing with china glost has been developed

of Driver Harris " Nichrome V " wire, are in the form of 1½ in. diameter helices 6 ft. 6 in. long and are supported on smaller diameter " Sillimanite " tubes, which are in turn supported on slotted protrusions on the

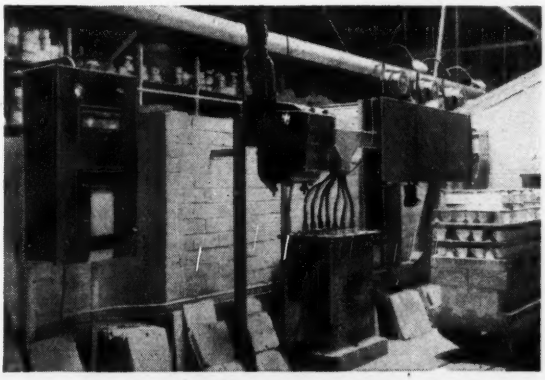


The entrance to the kiln showing the transfer and pushing gear

inside of the kiln in such a way that the elements are free to expand, are totally unmasked and can thus radiate in all directions. Although the maximum loading is about 75 kW, the normal consumption over a long period has been found to work out at 63·6 kWh an hour or 3·6 to 4·8 kWh per dozen of ware, depending on the type of ware being fired.

For firing glost the average life of the elements is given as eighteen months, but many of them have been in operation for considerably longer than that. Incidentally, the British-made element wire is not brittle like the class of wire originally employed, and has a longer life. The manufacturers of the kiln do not believe in the use of externally removable elements, partly because of the heat loss which almost inevitably develops in the removable portions of the kiln, and partly because the elements are so robust, and sufficient reserve heating capacity is provided to render element replacement unnecessary except during the usual annual overhaul. Actually, this kiln has been in continuous day and night operation since September, 1939, except for its annual shut-down.

Although the kiln is capable of being operated at 1,150 deg. C.—in fact it has been—a maximum temperature of 1,050 deg. is generally found to be sufficient. Normally, all the elements are on circuit. The temperature is roughly regulated by an English Electric three-phase voltage - regulating transformer, which steps up the mains voltage of 415 V to 425 V and down in 10 V stages to 335 V. Fine control of the temperature is effected automatically by the use of an Electroflo indicating controller and three-point recorder, the latter instrument showing the temperature not only in the firing zone but also in two pre-heating zones, where, by the way, the temperatures are normally regulated to 800 and 900 deg. C. respectively. When the desired maximum temperature has been reached the controller actuates a Brookhirst contactor switch which cuts out a number of the elements: these are switched on again



The furnace control gear, showing, from left to right, the indicating controller and three-point recorder, the main circuit-breaker, the voltage regulating transformer, distribution box, and contactor switch

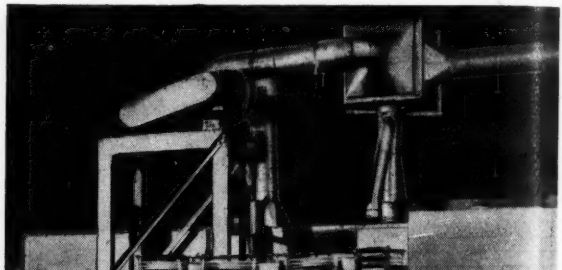
automatically as soon as the temperature drops below a certain figure. All the leads from the elements are taken to an M.E.M. distribution box, the main supply to the kiln being controlled by an Ellison oil-immersed circuit-breaker.

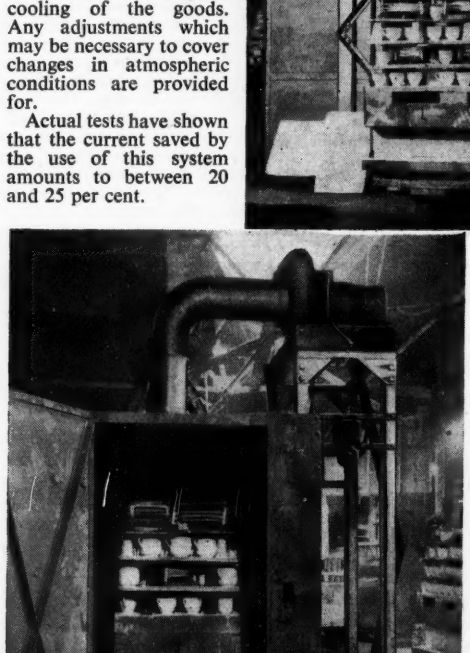
To conserve heat and also to secure further control of the temperature in the various zones of the kiln, a Gibbons " Controvec "

system has been incorporated in the plant. By the use of this feature currents of low-velocity air are blown, by a fan with a 2-HP Crompton Parkinson motor, *via* filters and ducts into the top and sides at either admission or exit ends of the kiln, the air flow being regulated by dampers inserted in the ducts.

This scheme very effectively counteracts the flow of hot air currents, which in tunnel kilns tend to flow from the hot zone to the end zones and cause a substantial heat loss, besides retarding the cooling of the goods. Any adjustments which may be necessary to cover changes in atmospheric conditions are provided for.

Actual tests have shown that the current saved by the use of this system amounts to between 20 and 25 per cent.





Two views of the discharge end of the kiln, showing the "Controvec" system

We should like to thank George Jones & Sons, Ltd., for their permission to inspect the kiln, and also Mr. D. Eardley, their general manager, and Mr. G. Turner, of G.W.B. Electric Furnaces, Ltd., for their help in the preparation of this article.

Swedish Technical Advances

IN the course of an article on this subject the *Anglo-Swedish Review* says that the question of insulating material is a big problem to the Swedish electrical industries. One of them, the important A.S.E.A. concern has satisfatorily solved this problem. It has been able to produce a kind of bakelite, which is as good as the type hitherto imported, and can be entirely produced from Swedish raw materials.

Government laboratories have produced a type of varnish used to insulate conductor wire, which replaces imported varnish. This new Swedish product has been used in the preparation of metal plate for the canning industry.

Besides the special problems of the electrical industry, other experimental work has been done by A.S.E.A. laboratories. For instance, with the assistance of Professor Theo. Svedberg, at Upsala, they are preparing a new method of producing synthetic rubber. A very important product, the special oil used to insulate and cool transformers, has been obtained from Swedish shale oil. Formerly 3,000 tons of this special oil had to be imported, now requirements can be met by home production.

Switchgear Instruments

Mounting and Operation

BADLY placed measuring instruments are difficult to read accurately and with DC and moving coil types particularly, indications are liable to be affected by the strong fields adjacent to conductors carrying heavy currents. Considerable errors may be produced when instruments are close to vertical busbars, the magnetic field produced being added to, or subtracted from, the instrument's permanent magnet field when its cast iron case does not afford sufficient shielding. With the powerful magnets now used the effect is less than it was with tungsten steel magnets, but it is desirable that additional shielding should be provided if vertical conductors must be near the back of the instruments.

Switchboard indicating instruments should so far as is possible be fixed at eye level; if higher or lower they should be tilted to accord with the line of vision. Otherwise accurate observation is difficult and parallax errors make correct readings almost impossible.

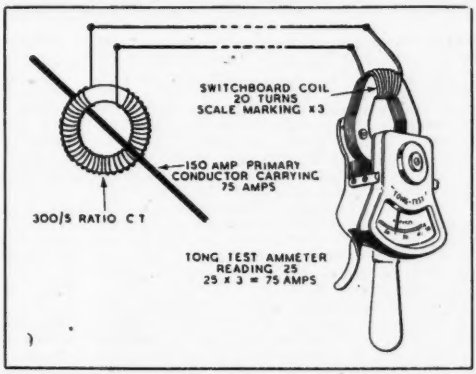
To preserve symmetry of appearance ammeters and voltmeters are usually of the same scale length. Generally a voltmeter has to indicate a small variation from a normal position only and should, therefore, be of the largest convenient dial diameter and preferably have scale markings with the widest division at the normal working point. In the moving coil or moving coil rectifier type this normal point with wide divisions can be given two-thirds of the scale if the magnet system is suitably arranged. With voltmeters for distant observation of a small up or down variation the wide divisions may be mid-scale, to bring the pointer vertical at normal. This applies also to moving-coil voltmeters having suppressed zero scales. The effect of such special magnet systems is to increase the pointer movement for a given voltage variation as compared with linear scale instruments.

For current indications moving coil ammeters may also have either logarithmic scales with the same percentage accuracy all over the scale, or with their widest divisions at mid-scale or two-thirds over scale. Before the war these special scale instruments were receiving increasing attention, but it is doubtful if they are procurable under present conditions. Moving iron ammeters and voltmeters can also be produced with the wider divisions either at the lower, middle, or upper end of the scale according to circuit requirements. Ammeters can often conveniently be smaller and have shorter scales than would be requisite for voltmeters.

The use of rectifier moving coil ampere indicators operated off transformers is likely to become general because their extremely small energy requirement makes remote indication easier and reduces the size of transformers necessary. Another advantage is their linear scales when readings are required all over their length and they make more convenient the use of the miniature type of instrument.

Fashions do to a small extent determine the types of instruments fitted to switchboards. Sometimes there is a passing fancy for rectangular cases, then for miniatures, but with 120 deg. scales the round projecting type is generally the choice, as it needs the least space on panels per inch of scale. Edgewise instruments are becoming obsolete owing to the difficulty of reading them without parallax errors.

Moves are being made in the direction of the standardisation of British instrument case dimensions, fixing centres and stud positions, which would not only be a great convenience in interchangeability for home switchgear makers and users, but also assist export sales. German and American instrument cases were standardised before the war. Carefully considered recommendations have been made for the adoption as standards of round pattern instruments having dial diameter and/or scale lengths of 3¼ in., 4 in., 6 in. and 8 in., but as an alternative Crompton Parkinson, Ltd.,



Bar-primary current transformer in combination with clamp-round ammeter

suggest that a 5 in. instrument might with advantage take the place of the 4 in. and 6 in. as a convenient intermediate size. When the 6 in. instrument first obtained its lead as a popular size the pointer had a 90 deg. movement, allowing a 4½ in. scale, whereas a 5 in. instrument with modern 120 deg. movement would need a scale half an inch longer.

For low voltage AC switchgear intended for export to places where maintenance might be difficult or the conditions of use likely to affect their operation, difficulties could be largely avoided by standardising the use of a ring type current transformer with secondary winding only, having a ratio, for example, of 300/5 and mounted with the conductor carrying the current to be measured passing one or more times through its aperture. The transformer secondary winding would be coupled in series with coils having a varying number of turns fixed in a readily accessible position on the switchgear to enable a "Tong-test" or clamp-round type of portable ammeter to be used (see sketch) the number of turns in the coil being varied to give full scale deflection on the instrument at the maximum current to be indicated: the coil would be marked with a figure giving the multiplication of the scale figuring. When the primary is a conductor carrying small currents two or more turns may be made through the transformer to utilise the upper part of its performance characteristic where accuracy is greater. By this means the number of ampere-turns required in the coil operating the instrument could conveniently be produced. This suggestion enables one single size and ratio transformer of low cost pattern to be fitted to give full scale deflection on the ammeter for various currents up to the limit of the transformer capacity. Only one ammeter is wanted for any number of circuits and of a type requiring no work to be done on the switchgear if the instrument is damaged or becomes defective. One spare current transformer and instrument should cover all requirements.

The following table indicates the currents conveniently measurable with a 300/5 transformer and a 0/50 "Tong-Test" instrument.

Max. amps in primary ..	300	200	150	100	75	50	25
No. of times primary conductor is passed through o.t.	1	1	1	2	2	4	8
No. of turns in switchboard coil operating the instrument	10	15	20	15	20	15	15
Reading multiplied by ..	6	4	3	2	1·5	1	0·5

Electricity in the Home

Conference at Erith

SOME aspects of post-war planning of domestic electrification were dealt with in an address by Mr. E. E. Hoadley, chairman of the E.D.A. Council, at a conference held by the Town and Country Planning Association in conjunction with the Erith Borough Council at Electricity House, Erith, on Saturday. Mr. Hoadley said that it was one of the major features in the electrical industry's policy to "make better to-day than yesterday," and this applied especially to homes. In matters affecting the home women should have more to say than in the past. Nothing was truer than the saying "A woman's work is never done"; if men had to work under the same conditions they would soon change them.

The electrical industry had united in trying to find out what the women of the country wanted, and had set itself to see how the appliances required could be manufactured in the quantities that would be wanted and at prices that could be afforded. Suggestions from three million women had been carefully considered. Constant hot water was the service most in demand, and in most cases could be provided by electricity without exorbitant cost.

The only way in which the working man's house could be equipped was by having the apparatus installed as an essential part of the house. No difficulty presented itself with regard to "subsidy" houses, but "jerry-built" houses were a different problem. He hoped, however, that pressure of public feeling would stop jerry building.

Most women wanted a kitchen of substantial size, say 10 ft. by 8 ft.; he would add another foot.

Electricity supply authorities should see that electrical apparatus installed was kept in full service. The tools were always the greatest cost of production in articles of this type and it was essential, if they were to be made available at reasonable prices, for them to be constructed and bought in large quantities.

Opening the discussion on Mr. Hoadley's address, Councillor G. W. H. Luck, chairman of the Erith Electricity Committee, said that women realised that electricity was clean and extremely convenient, and that the expense of running the apparatus was more apparent than real. The average price of electricity would almost certainly continue to fall. In Erith in 1936 there were only 100 cookers installed but, following the introduction of a "free" cooker scheme, at the outbreak of war cooking was done electrically in half of the 11,000 houses in the borough.

The next speaker, Mrs. Ling, believed that Erith had perhaps progressed too quickly and that it might be better to educate people to the use of apparatus before making it available to them. Mr. Andrews of the Poplar Electricity Department, agreed with Mr. Hoadley that without adequate space in the kitchen there could be no development. A calculation based on consultations with manufacturers showed that the cost of the kitchen unit designed by Mr. R. Illingworth, Poplar borough electrical engineer, was £50.

Electricity in Wartime—III

Load-Building Aspects

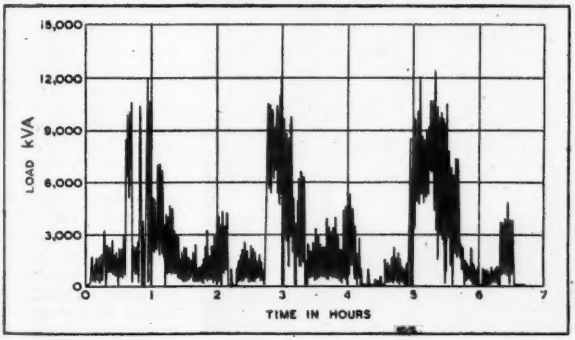
IT is far from the purpose of this article to attempt to assess the effects of the war in terms of electricity outputs, although for the purpose of indicating the types of wartime problems bearing on load building we are using a few figures which have no meaning beyond this aim. Generally speaking, there have been great increases in total outputs during the past few years, but to attribute any part of these to war effects by comparison with the hypothetical increases had peace continued would be—in view of the acceleration just before the war—something approaching pure speculation.

For one large mixed industrial, residential and agricultural area the output rose from about 600 million kWh in 1939–40 to about 900 million kWh in 1941–42. In a mainly concentrated industrial district the kWh sold rose from about 260 millions in 1939–40 to about 400 millions in 1942–43, with a maximum demand increase from about 86,000 to about 100,000 kW. In a mainly residential town where the increase in the domestic load has outpaced the industrial, the total increase has been from about 45 million kWh in 1939–40 to 57 million kWh in 1941–42. We must emphasise again that these figures are not necessarily representative of general conditions; they are merely indicative of the *type* of load growth that has taken place in very many parts of the country. On the other hand there are undertakings and districts which have suffered decreases because of, *inter alia*, the evacuation of industry and/or population.

As might be expected from the above there have been big increases in revenue, but the relationships between revenue and loads have altered considerably for a variety of reasons—alterations in the balance between high-revenue and low-revenue loads, higher costs of fuel and materials, and local policies regarding tariffs, to take a few instances. Associated with the output increase from 260 million kWh to 400 million kWh there has been a rise in revenue from about £825,000 to £1,000,000, without any tariff increases whatever. In another case a revenue increase from about £575,000 to £775,000 has been produced by an output increase from about 192 million to 250 million kWh.

The relationship between expenditure and revenue has also been upset and in this connection there does not appear to be any similarity between any

Showrooms are being extensively used for maintaining good relations with, and the goodwill of, consumers

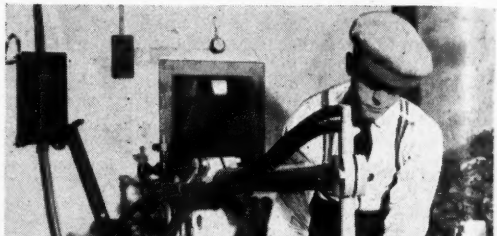


The load of a 7,500-kVA furnace on an e.h.v. network fluctuates from "light" up to 12,000 kVA

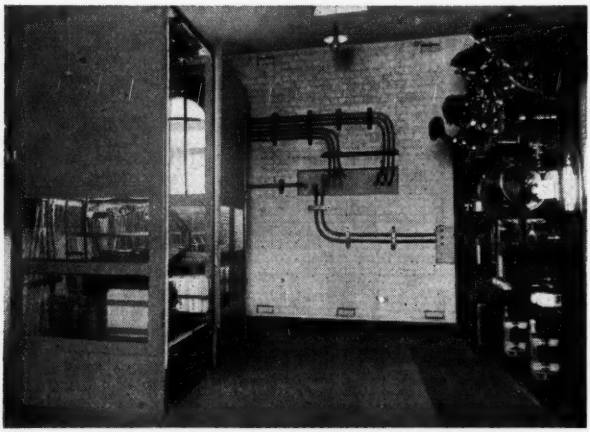
classes of undertakings or even individual undertakings. To take one example at random, an expenditure in peacetime on ordinary development provided for between three and four thousand consumers per year. Since the beginning of the war about £64,000 has been spent on a comparatively few new factory connections only, representing an increased load of about 18,000 kVA. Because of a few continuous-process industrial consumers this undertaking had a good pre-war load factor of about 45 per cent. The figure is now about 80 per cent., but the small increase on a high figure means so much more than a similar increase on a low figure.

With such upsetting of conditions as indicated in the foregoing it is not surprising to find a good many changes in the load curves. A few engineers at least find that they now have morning peaks instead of evening ones, but these should not be confused with the morning cooking peaks which were becoming common before the war. They are purely due to the industrial-load rise.

Some of the more erratic load changes are to be found in those areas where the domestic load still predominates, and the following analysis on a percentage basis is typical, not of any relationship between the classes of load, but of the upsetting of the pre-war trend. Taking the total output for 1942 as 100 per cent., the industrial, heating, two-part tariff (domestic) and lighting outputs for the same year are 41·6, 7·4, 43·8 and 8·2 per cent., respectively, while the corresponding figures for 1939 are 25·8, 3·5, 21·0 and 8·7 per cent., respectively, the total output for the earlier year being 59 per cent. of that for the later year. Between these years the population of the district fluctuated considerably, but it settled down to about a 30 per cent. increase, and from a number of similar analyses one can suspect a rough sort of relationship between wartime populations and loads, and there appears to be a similar relationship between wartime load and temperature. We hope these speculations will be regarded as such. We use them here just as indications of wartime "snags."



Ways and means have been found to cater for welding plants which have sprung up on all parts of systems

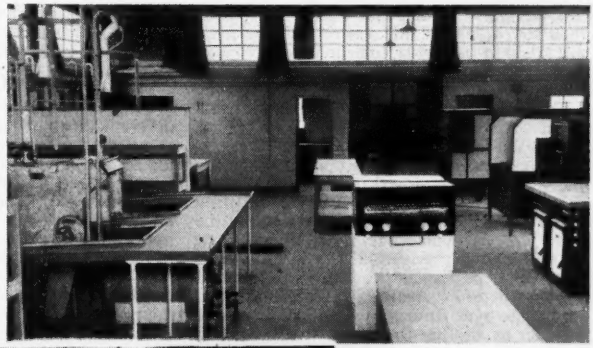


A wartime traction increase from 10 to 11 million kWh has led to a 500-kW extension in a traction rectifier substation

No doubt a better indication of load-building is to be found in the demand for meters. Following the limitation of new supplies to essential war needs one undertaking reports a decline in the demand for meters from a pre-war figure of 50,000 per annum to 20,000. Only in the case of polyphase meters has the demand been maintained at the pre-war level, thus reflecting the demands of industry for additional power

supplies involving meters of the larger capacities. A considerable number of pre-war consumers have called for meters of increased capacity, and there has been a heavy demand for meters used in conjunction with electric furnaces. War conditions have also resulted in applications for meters to make the special measurements involved in night-load and/or load-factor tariffs.

Having attempted to outline the difficulties of the supply engineer with regard to total loads and outputs, let us, before dealing individually with some types of loads, refer first to completely lost loads; it may help to get a better perspective. First, there is public lighting, a low-revenue load which to some extent has been replaced by public sign and shelter lighting without great additional expenditure. Then there is the shop window lighting load—quite a different story because of its high revenue—and one undertaking lost about £20,000 of revenue from this in about the first three years of the war. Electricity for this purpose was sold at 3d. to 4d. per kWh and the only field for regaining the lost load is in power supplies at about 0·5d. per kWh.



Above: Many of the war workers' hostels have all-electric services
Left: The amount of domestic apparatus now brought in for reconditioning often exceeds that of pre-war days

Rather outside, but definitely related to, such lost loads there are the load losses from general wartime restrictions, the least identifiable quantity of all, perhaps, and the load lost as the result of fuel econony. These appear to affect the domestic load more particularly, although greater results from fuel economy are expected from the industrial field. One essentially residential-area undertaking experienced a drop of 7 per cent. in its domestic load in the first three months of the fuel economy campaign.

Many undertakings have done highly creditable work in fuel economy and the following is an outstanding example. Well over a year before the Government initiated the national campaign for economy in electricity consumption the undertaking carried out propaganda amongst its consumers, involving a progressive series of illustrated advertisements in the local Press. Special lectures, exhibitions and demonstrations were also held. The undertaking also made a special effort in the industrial field by setting up a temporary Fuel Economy Section, consisting of three technical engineers who visit selected works, with the consent of the owners, and suggest practical steps which could be taken to effect economies. The service has met with a very gratifying response from consumers. The undertaking is represented on the Regional Fuel Economy Committee of the Ministry of Fuel and Power.

Except for certain areas where conditions are governed by special military considerations we can hardly imagine an undertaking in the whole of the country which can report an "overall" reduction of its industrial load as the result of the war. True, in the early days of the war, during the transition stages, there were many cases of reductions due to the cessation of peacetime manufacturing, but

this period quickly came to an end, and with the intensified war effort after the fall of France there came a clamour for power from both new and existing factories. In many mixed-load undertakings the order of the day is 75 per cent. of the total goes to industry. The 6·6-kV consumers appear to be the truer guide to wartime industrial increases, and out of a total present industrial output of about 200 million kWh for one undertaking the total load of such consumers is about 150 million kWh, compared with the peacetime figure of 85 million kWh.

The difficulties relating to such increases are, of course, more marked in the pre-war mixed-load and residential areas than they are in those which had previously been intensely industrial and where load increases are taken in the stride, their main effect being improved load factor through increased 24-hour working of the factories. Perhaps the greatest difficulties relate to the smaller factories such as furniture works and garages of the mixed-load areas. Many furniture factories employing, say, 200 operatives before the war, now employ 1,000 or more, with greater use of electricity. Another difficulty is the changing demands with the trend of the war. A particular factory may stop or partially stop production for a long time because its particular product is not wanted for that period. Again, a factory may have to change over from the manufacture of one product to another for a similar reason, and in consequence make little or no demand on the undertaking during the transition period. Here and there one finds a high-load peacetime factory which has had to be put on a lower-load war production. For instance, a pre-war silk factory which had a demand of 5,000 kVA and consumed 25 million kWh per annum now has a reduced demand of 3,000 kVA and 15 million kWh per annum.

Domestic Load Increases

One of the biggest surprises of our investigation has been to find really big increases in the domestic load during the war years. A very large undertaking reports a domestic load increase of 30 per cent., while in the case of a medium-size undertaking it is as much as 50 per cent. We know of a corporation housing estate where the consumption has risen by 16 per cent. Another undertaking is connecting new domestic consumers at the rate of 30 per month on grounds of hardship and war-effort contributions. From these facts alone it is obvious that if there were no restrictions on the development of the domestic load most undertakings would be doing enormous business. But what are the causes of this anomaly? Firstly, there are the hardship and war effort contribution cases. The former include the family with the husband in the Forces and the wife who goes out to work and finds her burdens considerably eased on returning home by the use of the electric radiator, and perhaps the electric cooker, instead of the coal fire, while the latter include the household which boards war workers and has not sufficient normal heating and cooking facilities. Then there are the war-workers' hostels, many of which have all-electric services. Some undertakings attribute the increase mainly to the greater spending power of workers who can now afford to use the electric fire as a mere convenience. We also hear of people without priority and not entitled to any concessions being able to purchase electric fires; many of them are doing so as a means of overcoming their coal-supply difficulties. A load closely allied to the domestic one is that of the electrically equipped British Restaurants which are now making their effect felt on the load curve.

Direct Grid Supplies

Generally, the problems associated with different types of loads are not felt so much in connection with direct war factories, the loads of which are more in the nature of bulk supplies, and undertakings which were laid out to deal with specific types of loads now take these in their stride. Of outstanding importance are the very large loads which have been met by direct tapping of the grid, and in this connection we point to what may well be the greatest achievement of all, namely, the pooling of national resources through the grid, which has enabled supplies to be given as required by the undertakings concerned, in many cases far in excess of local generating capacity.

Outside the special cases of factories and undertakings, however, various types of war loads present peculiar problems. The transport of war workers to and from the factories is reflected in the traction loads of some undertakings. In one case an increase of 10 to 11 million kWh per annum is attributed to this and the result is a two-bulb 500-kW extension to the rectifier equipment in a traction substation. Some undertakings have been perturbed by the welding plants which have sprung up on all parts of their systems, but ways and means have been found to cater for them, and where there is plenty of copper on the truly industrial system there is little disturbance. Otherwise the solutions, according to the supply conditions, are p.f. correcting condensers, static balancers, easement of supply regulations and, above all, careful operation of the plants by the consumers. One undertaking which before the war limited the size of welders on its l.v. system to 10 kVA will now accept 25-kVA spot welders and 32-kVA arc welders. Such machines will sometimes draw up to 200 A peak load, but no serious complaints have been received.

Similarly, all sorts of furnaces are now working satisfactorily where they would not have been acceptable before the war. On an l.v.

network a 36-kVA S.P. furnace is giving good service, although arrangements have been made to prevent excessive voltage regulation. Again, on an e.h.v. network two 7,500-kVA furnaces take a heavy fluctuating load from " light " up to 12,000 kVA. There are many cases of new large furnaces supplied direct from power stations and e.h.v. distribution centres. In the rural industrial areas the brickworks loads appear to have dropped off considerably, while the quarry loads are increasing, although these fluctuate a good deal with varying demands from aerodromes.

The war has definitely broken down the old conservatism of the farmer with regard to the use of electricity, and very great development in the electrification of farms has been brought about through the need for increased food production. A steady increase of 10 HP per week is the report from one undertaking with a fairly large agricultural area. It is wanted mainly for grinding cattle food, milking and grass drying. Pumping is another load which has shown considerable increases, largely due to military camps, while the use of battery vehicles, mainly for milk and bread delivery, has been greatly extended in many places.

It is necessary to dispel a belief that showrooms are used nowadays solely for the highly creditable work of assisting the Government in the dissemination of official information and in connection with various national appeals—fuel and food economy, etc. They are being used extensively for maintaining good relations with and the goodwill of consumers. For instance, one large undertaking reports that, in view of the lack of spares and replacements now being experienced and of the fact that most electrical contractors are now unable to execute repairs, the amount of domestic apparatus which is brought to the showrooms for reconditioning far exceeds that of pre-war days, and this service is much appreciated by the consumers.

There has been, of course, much expenditure on mains, etc., to meet the demands of consumers for purely wartime production, and it has been found necessary to safeguard the financial position by obtaining from such consumers proportionate contributions towards this expenditure, with agreement to pay an adequate minimum amount of the annual account over a specific number of years. Consumers are naturally reluctant to commit themselves to too long a period and this has led to some of the biggest wartime load building problems, which are often solved by compromise.

The general conditions outlined in this article have led to the somewhat popular use of the term " salesmanship in reverse." However this may be, we strongly emphasise that there has been nothing like " load building in reverse."

New Zealand Power Plan

THE New Zealand Cabinet has approved a ten-year plan for increasing the Dominion's generating plant capacity which has been prepared by the Chief Electrical Engineer of the Public Works Department (Mr. Kissel).

The proposals are largely concerned with the North Island, where a serious power shortage has developed, but Mr. Kissel points out that the position in the South Island, though not so acute, is getting behind. It is estimated that it will be necessary to spend £2,100,000 a year in the North Island and £1,200,000 a year in the South. Future planning, Mr. Kissel considers, should be based upon an annual increase in consumption of 10 per cent., which would mean that the plant capacity in the North Island in 1951 would require to be 730,000 kW—an addition of 500,000 kW.

Proposed developments are centred around the Waikato River and Lake Waikaremoana. Work is at present in hand on two units at Arapuni (43,000 kW) and three at Karapiro (90,000 kW), both on the Waikato River, and one unit (20,000 kW) at Piripaua (Waikaremoana). More recently a scheme for another 32,000 kW has been started at Kaitawa (Waikaremoana). One of the Arapuni units and that at Piripaua should be ready this year and the Karapiro project by late 1945, until when operating restrictions must continue.

Altogether, there are ten feasible sites for hydro-electric stations on the Waikato River, including Arapuni and Karapiro, and it is proposed that three other schemes at Whakamaru (150,000 kW), Ohakuri (100,000 kW) and Maraetai (80,000 kW) shall be undertaken. Considerable survey work has been carried out with satisfactory results, and it is recommended that the first of the three schemes shall be started well before the completion of the Karapiro station. Concurrently, it is suggested that the whole Waikaremoana scheme should be finished, with two or three smaller stations before Piripaua.

With regard to steam stations, Mr. Kissel considers that their high cost and the difficulties of obtaining adequate coal supplies make them unsuitable for extensive development in the Dominion.

It is proposed to construct a 220-kV transmission system through the centre of the North Island from Penrose to Wellington in place of the present 110-kV system to reduce transmission losses.

Commenting on the plan, the *New Zealand Electrical Journal* says that what is needed and what is certainly not provided for is the immediate installation of some 50,000 to 100,000 kW of plant, steam if this can be provided more quickly, or small hydro-electric plants, in order that some relief may be given to the already overworked main and standby stations. It is pointed out that the plan aims at an output of about 2,300 million kWh in 1951, whereas the distributing authorities consider that they will need more than this in 1949.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Electricity Supply Reorganisation

IN the leading article in the current issue of the *Electrical Review*, and by the insertion of the writer's photograph in the body of the report on the electricity supply industry's memorandum on post-war planning, credit is given, incorrectly, for the preparation of this excellent piece of work to the Joint Committee of Electricity Supply Associations.

The Committee which prepared the memorandum was, in fact, an *ad hoc* body of representatives of the various Associations named in the memorandum. They carried out their work under the chairmanship of Mr. F. Newey, President of the I.M.E.A., and the large measure of agreement attained was mainly due to his able and tactful leadership.

I would be pleased if you would kindly publish this letter in your next issue and make such comment thereon as you, in your wisdom, think desirable.

*Stratford, E.*15. J. W. J. TOWNLEY,
Chairman, Joint Committee of Electricity Supply Associations.

[We plead guilty to a slight lapse. Although the members of the *ad hoc* Committee to which Mr. Townley refers were representatives of the member-Associations of the Joint Committee they were acting independently of the latter body which had failed to reach agreement on the subject of reorganisation. Mr. Newey stated last week that the bodies represented on the *ad hoc* Committee were at liberty to produce separate (or supplementary) memoranda if they wished to, and, in fact, the I.M.E.A. has already prepared one for the consideration of its members (see page 197).—Editors, *Electrical Review*.]

ON reading between the lines, the report of the committee of undertakings reviewed in your issue of February 4th appears to be largely opposed to the McGowan Report. Everything points to public control at some date; whether public or private is immaterial, as shares will presumably be limited as to interest.

The main needs are:—(1) The formation of area committees at the earliest opportunity. These should include deputy engineers or distribution engineers (since these men know the networks) as well as the chiefs of the main undertakings in each area. (2) The promotion of tariffs, rural electrification and cheaper supply generally. These are based on better load and diversity factors and more standardisation. The only way to get these is by constituting larger authorities. It is impossible to get 100 per cent. efficiency from committees composed of perhaps thirty councillors and one engineer representing each a vast number of undertakings. Many undertakings now take their lines miles to small hamlets when only a few hundred yards away are the lines of an adjoining authority. Larger undertakings with more electrical brains is the only solution.

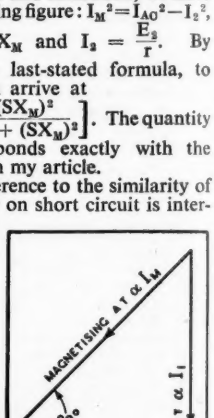
"SAFEGUARD."

Dynamic Braking

IN reply to Mr. J. W. Hibbert's letter in your issue of January 28th, your correspondent does not appear to have fully understood the significance of the equivalent circuit given in my article. As a matter of interest it may be derived from a consideration of the ampere turns.

Neglecting leakage and saturation, we have from the accompanying figure: $I_M^2 = I_{AC}^2 - I_2^2$, also $E_2 = I_M \cdot SX_M$ and $I_2 = \frac{E_2}{r}$. By substitution in the last-stated formula, to eliminate I_M we can arrive at $I_2^2 r_2 = I_{AC}^2 \cdot \left[r_2 \frac{(SX_M)^2}{r^2 + (SX_M)^2} \right]$. The quantity in brackets corresponds exactly with the value for r_{2S} given in my article.

Mr. Hibbert's reference to the similarity of this to an alternator on short circuit is interesting, but it should be borne in mind that the major part in this is played by the armature demagnetising ampere turns, the reactance being only of a secondary nature.



It will be seen from the above derivation of the formula that I_M increases in value as the speed and rotor current fall. This is contrary to his statement that my formula corresponds to decreasing flux.

Mr. Hibbert's test figures, which I have examined in detail, appear to correspond with those of a machine which is well saturated under braking conditions at full speed, the value of X_M being apparently 17·5, whilst throughout the test, even with the rotor current falling and hence with increasing

flux, the deduced value of X_M remains constant at 17·5 until 100 RPM is reached, when it rises to 20. I should have expected, on the contrary, that X_M would fall in value continuously as the speed fell. I notice also that he has made no allowance at all for leakage in his calculation, whereas I suggested 10 per cent.

Manchester. THOMAS MILLAR.

Compulsory Regulations

IT is satisfactory to note that the *Electrical Review* has devoted a good deal of space to the installation side of electrical engineering. Judging from the points of view expressed (and not expressed) it would appear that compulsory registration and compulsory rules are looked upon with disfavour. Basic safety regulations and codes of good practice are all very well, but are, and will be, more often breached than honoured—until something more drastic is done.

Mr. F. H. E. Myers, in your issue of February 4th, hits the nail on the head. Until legislation is brought to bear on those engaged on installation work, serious accidents in bathrooms and such places are likely to occur. Anyone whose business has been to examine the very many examples of terrible installation in existence is bound to come to the conclusion that electrical contractors who value their reputation are in the minority. New Zealand knows how to deal with shoddy contractors and inflicts heavy penalties on such delinquents. In this country anyone with little or no knowledge of electrical science can engage in installation work, without restriction, and indeed a large number of such people appear to have received encouragement. If a reasonable degree of safety is to be attained and electrical contracting placed on a higher plane, then, compulsory registration and rules are the only solution.

Glasgow. ALEX. MILNE, A.M.I.E.E.

Transformer Protection

IN reply to Mr. Abbott's letter in your issue of January 28th, I would point out that restricted-zone earth-leakage protection should be an independent circuit and that under no circumstances should additional relays or instruments be connected to the secondary windings of the three line-current transformers.

Generally the lengths of the three line pilot wires are identical. During tests on the instruments cited in the article r_5 was also of the same value although I agree that this would not always be the case.

If the three line and neutral pilot leads are starred on site it is then only necessary to take two leads to the control panel. Consequently r_4 is large in comparison with r_1, r_2, r_3 and r_4 but small compared to the stabilising resistanee.

I agree that a low impedance milliammeter must be used when measuring the "steady" spill current and that the tests should be carried out as rapidly as possible.

If the current transformers are properly designed and the transient and stability tests thoroughly carried out mal-operation should not occur in service. On the "set-up" described in the article "sudden" applications of full fault current were made for eight different conditions of stability. Each set consisted of ten "shots" and two oscillograms were taken during each set. This particular protective scheme has been in service for over two years without a report of mal-operation having been received.

Eltham, S.E.9. H. E. FORREST.

House Wiring Schemes

HAVING read Mr. Jacobi's article "Domestic Ring Main" (*Electrical Review*, December 31st) and the consequent correspondence in subsequent issues to date, I am left with a recollection of several phrases, such as "The public has already been educated . . ." ; "It should first be ascertained whether it is not merely readjustments and improvements of existing tried methods that are actually required"; "The opinions expressed have been so diverse that it would seem that an impartial survey might be of value."

May I suggest that if all that has been said is primarily *pro bono publico*, the most important point, so far as the general public is concerned, is not the capacity of the ring main, or the capacity and make-up of the plugs and sockets, but the location of the latter. Why must contractors fix our power points on skirting boards, so that in the event of trouble we must lie flat on our stomachs and struggle with the wretched things located a matter of 4 in. off the floor level, and even if they do not go wrong, and supposing some trivial part can be replaced for a few pence (whereas in fact it cannot), why must the domestic operator risk braining himself or herself on the edge of the mantelpiece every time the plug is inserted or withdrawn? Is it too much to ask that the power plugs shall be fixed 30 in. above the carpet?

*London, S.W.*14. D. P. WILSON.

MR. FORBES JACKSON'S examination of "uprating" and of fused plugs and sockets, in your issue of January 21st, would appear, as a point of economics, to make out a somewhat stronger case for the "ring main" than has been made hitherto by virtue of his preference for the fused plug as against the fused socket-outlet, the former being the less costly.

The question now arises as to whether such a system of wiring is likely to comply with future amendments of the I.E.E. Regulations. For instance, amendments will be required

to Regulation 201A to permit the fused plug as a final sub-circuit, Regulation 201B to increase the final sub-circuit capacity from 15 to 30 or 40 A and Regulation 116A to permit fuse protection of a current rating twice that of the cable. I would suggest that it is very questionable whether the Wiring Rules Committee would issue such amendments (which would seem to introduce certain elements of danger) unless the case were supported by overwhelming advantages. This, so far as the ring main is concerned, is not so.

With regard to the limitation to 2-kW outlets, have the 3-kW portable wash-boiler and the 3-kW portable cooker been forgotten or must these in future be of the fixed type in order to justify the introduction of a 10-A socket outlet? Has not the use of a 3-kW fire, in many cases, been prohibited, owing to the inadequacy of the rating of the socket outlets installed? What is wrong with the existing 15-A, three-pin B.S.S. socket outlet and why limit the benefits of electricity in the home? Surely these questions provide their own answer. Would it not be better to provide socket outlets to cater not only for the 3-kW appliances which now number many scores of thousands, in small houses as well as large, and also at the same time to provide some margin of current carrying capacity for the 2-kW appliances. I am wholeheartedly in agreement with the last sentence of Mr. Forbes Jackson's article.

Coventry. A. J. HEELIS.

MR. JACOBI'S article in your issue of December 31st has had the desired effect of giving much food for thought. The letter of Mr. C. T. Westlake published by you on January 28th has greatly interested me, but the adoption of a 30-A cartridge fuse as a means of safeguarding the ring main does not strike me as ideal as it may continue to encourage unqualified interference. My contention is that the circuit-breaker offers the best means of protection to the ring main against both faults and the amateur.

I agree that 99 per cent. of trouble is to be found in the flex, the lamp and the lampholder, and would add that in a number of cases this is due to misuse, poor quality or both. Outlets in my opinion should be of the 10-A three-pin and not the 5-A type. There are too many cheap and questionable accessories on the market which can be fitted by persons not knowing the risks incurred. By eliminating the sale of such goods to the consumer the upgrading of the 5-A plug might become feasible, but why call it 5-A, if it is designed to carry a greater current?

In the past builders of the so-called "modern" small houses have been prone to limit the number of outlets to one to each room, presumably in order to cut the price down. Each bedroom or any other room with the exception of the bathroom (where there should be no outlets) ought to have at least two three-pin 10-A outlets with suitable fused switches and provision in the skirting board for additional outlets.

For heating the modern small house 2-kW per room is ample, especially if the reflector type of electric fire is used. In the bathroom any electric heater should be built into the wall with switches that cannot be tampered with by children. Trouble due to flex and misuse of lampholders can be largely overcome in the small house by eliminating flex pendants at lighting points and installing throughout ceiling fittings or cornice lighting. Any trailing leads used should be sheathed with three-core tough-rubber or plastic material.

The ring main, which should be of 7/·029 cable, is in my opinion the only up-to-date method of installation suitable for the small house that can be carried out at a reasonable cost and at the same time with the maximum of safety.

Edinburgh. COLIN H. DAVIE.

Parliamentary News

Hydro-Electric Power

On February 18th in the House of Commons Mr. Ellis Smith asked the Minister of Fuel and Power if he would have a survey made of all rivers, lakes, etc., in order to ascertain where hydro-electric power production could be obtained; if consideration had been given to the practicability of harnessing the river at Conway for hydro-electric power production; and if he would have a comprehensive scheme considered on the basis of social ownership.

Major Lloyd George replied that the areas in Great Britain where hydro-electric power resources existed which might be capable of development on an economic basis were now being surveyed by the North of Scotland Hydro-Electric Board and the North Wales Power Co., who had included the harnessing of the River Conway in their survey.

B.B.C. Charter

In answer to Mr. Granville, Mr. Churchill said that the Charter of the British Broadcasting Corporation would expire on December 31st, 1946. The form in which it was to be renewed was already receiving careful consideration by the Government.

Radio Sets

Replying to questions by Mr. Mathers, Mr. Dalton said that supplies of many types of valves for civilian wireless sets were adequate, but some special types were short. In view of the very heavy Service demands, he regretted that he could not hold out any hope of an early increase. Larger quantities of other components were available for civilian sets than last year. Both the imported sets and the wartime standard sets would be distributed to retailers on the basis of pre-war trade. He hoped shortly to announce maximum prices for these sets.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE title of **Baron Royden of Frankby,** in the County Palatine of Chester, has been chosen by Sir Thomas Royden, Bt., chairman of Edmundsons Electricity Corporation Ltd., who was raised to the peerage in the New Year Honours.

Professor P. M. S. Blackett, M.A., F.R.S., has been elected president of the Association of Scientific Workers. Professor Blackett is Langworthy Professor of Physics at the University of Manchester, and during the war is working for the Admiralty. He is widely known for his work on nuclear physics and cosmic rays.

Mr. Norman Rylance, A.M.Inst.T., who has just been appointed manager of Rotherham Corporation Transport Department, was born at Bolton in 1898 and received his education at Bolton Secondary School. From 1913 to 1935 he was employed in the Transport Department of Bolton Corporation, rising from junior clerk to traffic superintendent in 1930. He joined Wigan Transport Department as traffic superintendent in 1930, leaving there in 1935 to take up an appointment as traffic superintendent to Rotherham Transport Department. Mr. Rylance became chief assistant of the Department in 1942 and deputy manager in January, 1943.

At a recent meeting of the Liverpool Branch of the Electrical Association for Women, Mrs. R. L. Burns, who presided, presented a cheque to **Mr. P. J. Robinson,** the retired city electrical engineer, in recognition of his services to the Branch. Mrs. Robinson was given a handbag.

Mr. J. Scott has retired from the position of station superintendent to the Accrington Corporation Electricity Department, and **Mr. A. Ecroyd** has been appointed his successor. **Mr. P. Smith** will succeed Mr. Ecroyd as shift charge engineer.

The Council of the Institution of Electrical Engineers has elected **Sir Ernest Thomas Fisk** to be an honorary member of the Institution. This distinction has been conferred upon him in appreciation of the services he has rendered in Australasia in the field of radio-communications.

Sir Ernest Fisk

Sir Ernest, who is a past president of the Institution of Radio Engineers (Australia), was managing director from1917 and has been chairman since 1937 of Amalgamated Wireless (Australasia) Ltd., and is also chairman of other companies concerned with wireless. Originally a member of the Marconi Company, he joined a special mission to the Arctic in 1909. He has generally been a pioneer of radio in Australia, including direct wireless communication with Great Britain, and received the first direct wireless message from England to Australia in 1918. In 1940 he was appointed secretary of the Economic Cabinet in Australia and Director of Economic Co-ordination.

The twenty-second award of the Faraday Medal has been made to **Dr. Irving Langmuir** for his outstanding contributions to electrical science. Dr. Langmuir's investigations have ranged over an extremely wide field. His work on hard vacuum valves, thyratrons and gas-filled incandescent lamps is well known. He has also worked on atomic hydrogen welding and carried out fundamental researches on oil films. He is a foreign member of the Royal Society and holds the position of Associate Director of the Research Laboratory of the General Electric Company in Schenectady, N.Y. In 1941 he was elected president of the American Association for the Advancement of Science.

Dr. Irving Langmuir

The Faraday Medal is awarded by the Council of the Institution not more frequently than once a year, either for notable scientific or industrial achievement in electrical engineering or for conspicuous service rendered to the advancement of electrical science, without restriction as regards nationality, country of residence, or membership of the Institution.

Bolton Town Council, on February 1st, decided to increase the salary of the borough electrical engineer, **Mr. A. E. Annett,** from £1,400 to £1,600 a year. The increase is retrospective to April 1st, 1943.

To mark his retirement on superannuation, **Mr. Frank Forrest,** chief engineer and manager of the Birmingham Electric Supply Department, was entertained at luncheon at the Grand Hotel, Birmingham, last Friday. Among those present were the Lord Mayor of Birmingham, Alderman Aldridge; Councillor H. A. Sale, chairman of the Electric Supply Committee, who presided, Sir Percival Bower, a former chairman of the Committee who has recently been appointed to the Central Electricity Board; Sir Johnstone Wright, chief engineer to the C.E.B.; Sir Frank Wiltshire, town clerk; Mr. F. W. Lawton, Mr. Forrest's successor, and other members of his staff.

Emphasising the pride of the city in its chief officials, and recalling the tremendous strides made in electrical development under Mr. Forrest's control, the Lord Mayor presented Mr. Forrest with an illuminated address containing a resolution passed in January by the Electric Supply Committee recording appreciation of his services during his thirty-eight years at Birmingham.

Drawing attention to some of the salient features of his career at Birmingham, Sir Johnstone Wright said that Mr. Forrest had made his mark on the electricity supply industry.

Apart from his engineering achievements, he had been largely responsible for the growth of the Birmingham undertaking. He had great commercial capabilities and had always been a "high pressure salesman" of electrical service.

The Lord Mayor of Birmingham making the presentation to Mr. Frank Forrest. On the left is Sir Johnstone Wright and on the right Councillor H. A. Sale

In reply Mr. Forrest said he hoped that his work would be of some permanent value to them. The Electric Supply Committee and the three chairmen he had served under had made his job pleasant and had always made him feel that he was working for the Committee and not being worked by it. The development of the undertaking during the past years had been great only because each man of his staff had done his best. If the reorganisation of the industry came about he hoped that it would take the form of reducing the number of supply authorities, standardising voltages and system of supply, and the introduction of tariffs on a national or semi-national basis and in simple form. Mr. Forrest is to retire to Lyme Regis.

Mr. W. A. May, representative of Berry's Electric, Ltd., before the war, has returned to the company on being invalided out of the R.A.F., and has been appointed manager of the export department.

Mr. R. W. Cotton, chairman of British Rola, Ltd., has joined the board of the Philco Radio and Television Corporation of Great Britain, Ltd. **Mr. E. M. Benjamin,** who has been with the Philco company for many years, has also been elected a director and appointed assistant managing director. **Mr. L. D. Bennett,** chairman of Philco, has been appointed to the board of Aero Engines, Ltd.

Mr. S. A. Harris has resigned from the board of S. Guiterman & Co., Ltd.

Mr. T. B. Brown has been appointed chairman of the West Gloucestershire Power Co. in place of Mr. John Davidson who has resigned from the board.

Mr. C. C. Roloff has recently joined Thorn Electrical Industries, Ltd., and has been appointed sales manager of the "Atlas" lamp division of the company's northern branch. Previously he had been for some years sales manager of the A.E.G. Electric Co., Ltd., and had considerable experience in the technique of lamp manufacture and sales both on the Continent and in this country. At the outbreak of war he transferred his activities to Metropolitan-Vickers Electrical Co., Ltd., and was in charge of the sales side of its projector and floodlighting department.

Obituary

Mr. J. M. G. Rees.—The death is reported, at Wimbledon on February 6th, of Mr. John Morgan Griffith Rees, A.M.I.E.E., at the age of sixty-two. Mr. Rees was a director of Oliver Pell Control, Ltd., Tok Switches, Ltd., and Varley Dry Accumulators, Ltd.

Mr. F. Madge.—We regret to learn from the February *Electrical Contractor* that Mr. Frank Madge, an old member of the Electrical Contractors' Association, died at Cardiff on January 21st. Mr. Madge held office for many years in the Cardiff branch of the E.C.A. (including the position of hon. treasurer), on the old Western Sectional Board and on the Council.

Mr. C. Dalley.—The death occurred at Sutton on January 27th of Mr. Christopher Dalley, M.I.E.E. Mr. Dalley, who was sixty years of age, was with the British Westinghouse Co. for some years and then joined the Anglo-Persian Oil Co. of which he became chief engineer. In 1927 he was appointed joint managing director of British Controlled Oilfields, Ltd., and later also of Trinidad Petroleum Development, Ltd. As an electrical engineer Mr. Dalley encouraged the fullest possible use of electrical methods in the winning of oil. At the time of his death he was president of the Institute of Petroleum.

Mr. H. Boon.—We regret to learn of the death on February 3rd, after an operation, of Mr. H. Boon, for fourteen years advertising and publicity manager of the Chloride Electrical Storage Co., Ltd. He was forty-six.

Will.—The late **Mr. Robert M. Abraham,** M.I.E.E., F.R.A.S., of Tewin, Herts, a director of C. F. Casella & Co., Ltd., left estate valued at £38,090 (£37,683 net personalty).

Ownership of Systems

I.M.E.A. Proposals

WHEN he presented the memorandum prepared by representatives of associations in the electricity supply industry last week, Mr. Newey said that each of these associations was at liberty to prepare a report of its own covering points which were not dealt with in the joint memorandum.

As readers know, such a report was published last November by the Incorporated Association of Electric Power Companies.

The Incorporated Municipal Electrical Association has produced its own separate proposals which were circulated to members at the same time as the joint memorandum. These cover the subjects of the ownership of distribution undertakings and generating stations and a national standard bulk supply tariff.

The Association submits to the Minister that, in any reorganisation scheme, the principle of public ownership, and in particular municipal ownership, should be retained and extended. It is evident from past electricity legislation that the intention of Parliament has been the ultimate public ownership of the industry and most provincial distribution companies are subject to a purchase clause. Power companies' undertakings are not subject to purchase rights, while the London companies' undertakings are subject to transfer to public ownership in 1971.

"Best Possible Service"

It is maintained that ownership of electricity distribution by local authorities who are responsible to the public and administer many essential public services already, ensures the best possible service to the public and any tendency towards bureaucracy is controlled.

The facts that local authorities can raise capital cheaply and amortise capital expenditure permit the prompt replacement of obsolescent plant and equipment and the lowest possible charges to the public.

It is recommended that in all cases in which local authority rights mature, the undertaking should be transferred to public ownership as soon as is practicable by (a) the immediate purchase by the local authority; (b) the temporary suspension of purchase rights until the maturing date of purchase of any neighbouring undertaking which will jointly form an economic distribution area and the purchase at that date by a single local authority or joint board of local authorities; or (c) the equation of dates of purchase of neighbouring undertakings and their transfer on the agreed date to a single local authority or joint board.

To eliminate dual rights of supply in areas thus acquired where they are in the areas of power companies the rights and assets of the companies should be purchasable. Any legislation for implementing the foregoing proposals should provide for the transfer of rights and assets of part or parts or the whole of a power company area to the new authority.

Generating Stations

The I.M.E.A. considers that, unlike distribution, the generation of electricity is essentially a matter for central control. It is said that the operation of the 1926 Electricity (Supply) Act has brought no financial advantage to the owners of selected stations, while the grid and the co-ordination of generation has given considerable financial advantage to a large proportion of non-generating undertakings.

Referring to the protection against being overcharged for energy purchased from the Central Electricity Board afforded to selected station owners, the memorandum says that the methods of computing hypothetical costs are rapidly becoming unworkable.

While, by the goodwill of the parties concerned, these arrangements have operated reasonably well and have achieved substantial improvements in the average generating efficiency, it is believed that the maximum efficiency and cheapness of generation can only be attained by vesting the complete responsibility for planning, construction, development and operation in one competent body. It is therefore recommended that all generating stations owned by authorised undertakings should be transferred to the Central Electricity Board. In this connection it is pointed out that under the Defence Regulations powers have been conferred on the Board to provide and operate generating stations.

Advantages Claimed for Central Control

It is claimed that the advantages accruing from this proposal would include the more efficient planning and siting of new, and the development of existing stations; a properly planned long-term programme of development in station design; a substantial saving in engineering costs; the raising of the general standard of operating efficiency to a closer proximation to the maximum efficiency; the extension of the field for the utilisation of very low grade fuels by the construction of specially-designed stations in the areas where these are produced; the securing of the best possible utilisation of manufacturing facilities, the saving of capital costs and the raising of the standard of design by controlling the purchase of nearly the whole of the generating

plant required; the improvement of the standard of technical ability among power station engineers, designers and operators alike, by organising adequate training, interchange of staff between stations and giving facilities to appropriate personnel to obtain experience of foreign practice; facilitating the institution of a national bulk supply tariff; and facilitating the investigation and possible development of district heating schemes.

It is appreciated that these advantages are already present, in some measure, in the large multi-stationed undertakings and an examination of the results obtained is claimed to support the contention that the proposal submitted has advantages of great national value.

National Bulk Supply Tariff

The present wide variation in the prime cost of energy to distribution undertakings is mainly due to the variable transmission charges which form part of this cost and while the latter continue to be separately computed for individual undertakings a wide variation will remain and any standardisation of prices to consumers will be impossible.

It is recommended that the Central Electricity Board should be responsible for the supply of energy to the receiving terminals of each distribution undertaking, for which purpose it would construct, purchase or rent such transmission lines as might be necessary. This would make possible the introduction of a national form of bulk supply tariff applicable to all undertakings.

In framing such a tariff the following factors must be borne in mind: The financial stability of the Central Board; the maximum demand at the point of supply with a sliding scale of kilowatt charge related to demand. (Such annual maximum demand would preferably be the average of the maximum demands during the months of January, February, November and December.); a running charge per kWh with suitable adjustment for variations in the cost of fuel.

The I.M.E.A. is of the opinion that "the adoption of a national tariff would remove many existing anomalies and provide an equal opportunity for development by all undertakings with ultimate benefit to the consumer."

Long-Distance Telephony

Lecture to Czecho-Slovak Audience

IN a lecture illustrated by lantern slides which he delivered to the Czecho-Slovak Institute on February 4th, Sir Stanley Angwin, President, I.E.E., Engineer-in-Chief of the G.P.O., described recent developments in communications which have materially increased their scope and possibilities as compared with those using loading coils. In telephony the introduction of feed-back repeaters and crystal filters had enabled twelve-channel and coaxial cable systems to be developed. In the first type (which had been greatly extended during the war and had proved a great asset in meeting the needs of the Services) the use of three wave bands of 4 kc, between 16 and 60 kc in pairs of conductors with repeater stations twenty miles apart, enabled one pair to deal with twelve times the traffic that could be handled by older methods.

With the coaxial cable, which employed a frequency range between 60 and 100 kc in three stages, 600 carrier frequencies would require only one pair of conductors, giving an equivalent number of circuits; the spacing of repeater stations was six miles. It would also be used for television after the prior requirements of telephony had been met. Coaxial cable was more easily repaired than multi-channel underground cable. Aerial coaxial cables had been used to a limited extent.

Improvements in switching had been in the direction of increasing reliability and it was now possible to use an automatic instrument to speak direct from Manchester to London, cutting out one operator; the needs of villages could now easily be met. Morse methods had now been entirely superseded in G.P.O. telegraphy by teleprinters. Voice-frequency telegraphy was similar in technique to twelve-channel telephony.

Remote Control

Co-ordination of Boiler House Auxiliaries

SOME of the aspects of regulating the operation of electrical apparatus from a distance are discussed in a paper submitted by Mr. A. Crawford to the Association of Supervising Electrical Engineers.

The author points out that remote control is usually adopted for safety, or convenience; for instance, it is advocated for the motors driving coal-face machinery as a means of overcoming the difficulty of providing and maintaining adequate switching capacity in the restricted spaces available within the machines themselves. In the other category is the grouping of starters, entirely for convenience, for controlling from a common switchboard all the boiler house auxiliaries that are dispersed throughout the power house buildings.

After dealing at some length with the control of boiler draught fans, the Ward-Leonard system of speed regulation is explained. Combustion efficiency depends fundamentally on the correctly co-ordinated control of the auxiliaries. The author contends that with infinitely variable speed-change precision and pre-selective setting from a central point must give more efficient results.

In base-load stations changes are usually made at least three times a day while in peak-load stations constant variations are experienced; even if when a single boiler is taken off load the remainder need to be immediately reset. From the point of view of combustion efficiency the author believes the Ward-Leonard system to be extremely effective.

COMMERCE and INDUSTRY

Projected American Merger. Arbitration Tribunal Awards.

E.D.A. Annual Meeting

THE annual general meeting of the British Electrical Development Association is to be held at the Connaught Rooms, London, W.C.2, at 3 p.m. on March 17th. It will be preceded by the annual luncheon at 12.15 for 12.45 p.m. The president, Lord Brabazon, will take the chair at both functions.

Contractors and Lighting

At the fourth sessional meeting of the Birmingham Centre of the Illuminating Engineering Society, Mr. J. Ashmore, M.I.E.E., gave an address on "Electric Lighting—a Contractor's Viewpoint." The speaker dwelt on the development of the modern fluorescent tubular lamp and also stressed the importance of legislation, on the lines of the Factory Lighting Act, for the lighting of public buildings. The efficient maintenance of lighting units had too often in the past been completely neglected, and a series of charts was produced to illustrate this point.

Mr. Ashmore advanced the opinion that contractors in the future would be asked to prove the efficiency of the lighting scheme installed, in a similar manner to the present electrical tests. Finally, he appealed for the encouragement of technical students to be trained as illuminating engineers to ensure ability in this profession to deal with scientific developments of the future.

American Telegraph Proposals

The Washington correspondent of *The Times* says that one of the problems faced by Mr. Adolf Berle, who has recently become head of the Communications Department, is the projected merger of the companies operating the external telegraph services of the United States. For the first time the possibility is being discussed of the American Telephone & Telegraph Corporation becoming a party to the merger. In this connection it is said that the competition of the international telephone services, combined with air-mail competition, would make it impossible for the merged telegraph companies to survive.

The correspondent mentions that two of the parties to the proposed merger, the International Telephone & Telegraph Corporation and the Radio Corporation of America, have large competitive manufacturing interests as well as operating interests. Nevertheless it is thought that the merger will be accomplished this year and that Government control will be stricter than that which exists in Great Britain.

Office Organisation

There has just been added to the "Office Aid to the Factory" series of publications of the British Standards Institution, 28, Victoria Street, London, S.W.1, a booklet of 64 pages (B.S. 1,100, Part 10, 1943, price 2s. 6d.) that is concerned with office organisation and practice. Its object is to furnish practical information about clerical organisation, principally for the assistance of firms employing from 250 to 1,000 people; yet it is sufficiently simple in its treatment of the subject to offer something of value to the needs of the smaller office. So many basic aspects of organised routine can rarely have been condensed into so small a space; the range including management, planning of systems, design and use of forms, selection of machines and mechanical aids, dissection of accounting, accommodation, lay-out and lighting needs, job grading, selection, training and co-ordinated control of staff, methods of inspecting work, and special sections on typing and filing,

B.T.H. Testers' Claim

The National Arbitration Tribunal has issued its award (No. 498) upon the claim by members of the A.E.U. employed by the British Thomson-Houston Co., Ltd., that testers should be on rates of pay equal to those paid to inspectors under the Coventry District Agreement of January 12th, 1943. Evidence was given on a number of relevant matters, including a comparison between inspectors and testers with regard to qualifications, skill and degree of responsibility, and the Tribunal having considered the statements finds that the claim has not been established.

Planning Engineers' Overtime

Another award by the National Arbitration Tribunal (No. 496) relates to a claim by members of the Association of Scientific Workers employed by Joseph Lucas, Ltd., as process planning engineers and methods engineers. The employees asked for payment of the present rates for a 41-hour week (instead of 47 hours), all extra time being paid for as overtime on a corresponding basis; they also claimed a production bonus. After consideration of evidence by both parties the Tribunal has come to the conclusion that the claim has not been established.

Flameproof Gear

The customary schedule of electrical apparatus, mining and industrial, for which certificates of flameproof enclosure were issued during the last three months of 1943 by the Ministry of Fuel and Power (Coal Division) is now available. Copies are obtainable (1s. 2½d. post free) from the library, Ministry of Fuel and Power, King's Buildings, Dean Stanley Street, London, S.W.1.

Poplar Demonstration Kitchen

Poplar Electricity Committee reports that the demonstration kitchen unit which had been built by the borough electrical engineer as nearly as possible to the dimensions and designs anticipated as suitable for existing kitchens and kitchens in new properties, has been lent to the British Electrical Development Association and has been on exhibition in Hull, Carlisle, Glasgow, Middlesbrough, Preston and West

Ham. The kitchen unit has also been demonstrated in London at Messrs. Heal's premises. The Association has expressed thanks for the loan of the unit and for other advisory service in connection with the exhibition which will have a very definite effect upon the interest of the industry as a whole.

Engineering Wages and Grading

Negotiations were opened in London on February 3rd, between the National Engineering Joint Trades Movement and the employers on the engineering trade unions' claim for an all-round increase of 10s. a week on basic rates. Separately, discussions were resumed between some engineering unions and the Engineering Employers' Federation on the unions' proposals for the further grading of engineering workers. At present there are roughly only two grades recognised for men—skilled and unskilled, although women workers have been divided into four grades, according to skill and experience.

No final reply was given by the Employers' Federation in respect of the claim for increased wages and it was agreed to adjourn the conference to enable the employers to consider the unions' statement.

Definite conclusions were not reached on the grading question and the *Press Association* understands that the question is to be examined again.

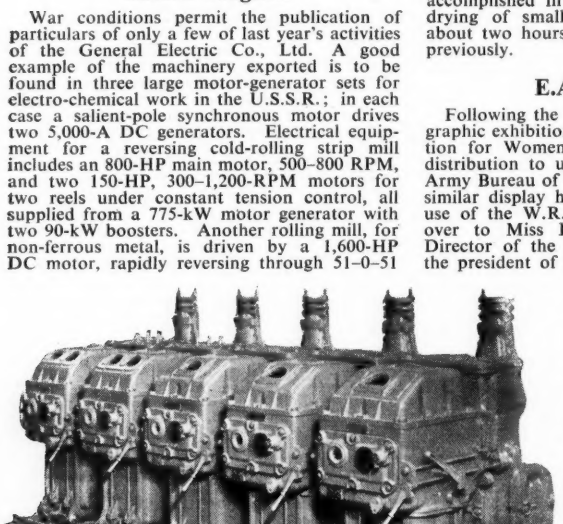
G.E.C. Progress

War conditions permit the publication of particulars of only a few of last year's activities of the General Electric Co., Ltd. A good example of the machinery exported is to be found in three large motor-generator sets for electro-chemical work in the U.S.S.R.; in each case a salient-pole synchronous motor drives two 5,000-A DC generators. Electrical equipment for a reversing cold-rolling strip mill includes an 800-HP main motor, 500–800 RPM, and two 150-HP, 300–1,200-RPM motors for two reels under constant tension control, all supplied from a 775-kW motor generator with two 90-kW boosters. Another rolling mill, for non-ferrous metal, is driven by a 1,600-HP DC motor, rapidly reversing through 51–0–51 RPM, which is supplied from a 1,340-kW flywheel motor generator. Orders have been received for a number of alternators and motors for ship propulsion.

What is claimed to be the first flameproof oil-immersed switchgear made to meet the draft recommendations (1941) of the Royal Commission on Safety in Mines has been introduced. Its overall height is only 3 ft. and no live metal can be exposed to atmosphere. An initial installation of eighteen units of 11-kV 350-MVA air-blast switchgear has recently been put into operation.

Substantial developments are reported in the feeding and conveying of material by electromagnetic vibration (using a pulsating current), which has also been applied to the consolidation of concrete. Similar in general principle is a sorting table, which enables bent radio valve pins to be removed, thus saving considerable time in the production of glass valve bases. For the visual detection of certain minerals in ores, Fraser and Chalmers works have designed a portable prospecting outfit consisting of a cold-cathode mercury-vapour discharge tube emitting radiation of 2,537 A.U.

A large number of infra-red heating installations was installed, chiefly for paint drying, including one with a loading of 500 kW consisting of two 42-ft. plants. Other applications were for the softening of plastics and the drying of foundry moulds, coils for electrical machinery and sawdust with considerable saving in time; thus, skin drying of foundry moulds was accomplished in from 5 to 20 min., and the drying of small coils and armatures within about two hours compared with twenty hours previously.



G.E.C. five-unit flameproof oil-immersed switchboard (3·3 kV, 300 A, 25 MVA breaking capacity) suitable for mining service.

E.A.W. Activities

Following the success of the portable photographic exhibition which the Electrical Association for Women presented to the A.T.S. for distribution to units in all Commands by the Army Bureau of Current Affairs ("ABCA"), a similar display has just been prepared for the use of the W.R.N.S. In officially handing it over to Miss E. M. Goodenough, Deputy Director of the W.R.N.S., on February 2nd, the president of the Association, the Dowager Lady Swaythling, said that electricity was going to play such an important part in the post-war world that the E.A.W. believed that its story should be presented in all its aspects to those whom it would vitally effect. Most of the seventy-five photographs and fourteen panels are similar to those of the A.T.S. display, but a nautical note has been introduced by photographs showing cooking aboard a submarine, repairing a cable in mid-ocean, shipbuilding, and ocean transport in an electrically-driven ship. The E.A.W. has now received a request for a third exhibition for the use of the W.A.A.F.

For the third time in four years the Derby Parkfields

Cedars School has won the Councillor Walters Rosebowl Trophy in the Electrical Housecraft Course for Schools, promoted by the E.A.W.

Last week the Association inaugurated its first wartime new branch near London, when, under the auspices and with the help of the South West Essex Technical College, the South West Essex branch came into being. Three hundred people were present when Dr. Lowery, principal of the College, opened the proceedings. Miss Caroline Haslett, director of the Association, spoke of the educational work of the Association, and its diplomas and certificates for teachers, demonstrators and home workers. Mr. E. S. Riley, borough electrical engineer of Walthamstow, welcoming the branch and offering his co-operation, spoke of the modern kitchen unit and pointed out that although in his area coal was three times its pre-war price, electricity tariffs had risen by only 10 per cent. The first officers of the new branch are Mrs. L. A. Brazier, head of the women's department of the College, chairman; Mrs. E. S. Riley, vice-chairman; Mrs. Avery, hon. secretary; and Miss Bennett, hon. treasurer. After the meeting all present went round an accompanying exhibition of apparatus lent by the College and the Walthamstow and Ilford Electricity Departments.

Appeal Against Railway Assessment

Last year the Railway Assessment Authority agreed the figure of £1,339,806 as the cumulo net annual value of the Southern Railway for insertion in the draft of the Third Valuation Roll. Subsequently the London County Council made representations against this figure on the grounds that the amount had not been estimated in accordance with the Railways (Valuation for Rating) Act, 1930, and that it was incorrect and inadequate. These representations were heard by the Authority which on December 17th issued its decision that the figure should remain in the Roll when completed. The L.C.C. Finance Committee now recommends that an appeal shall be made to the Railway and Canal Commission against the Railway Assessment Authority's decision.

Commercial Travellers' Association

The fifth annual luncheon of the Electrical Trades Commercial Travellers' Association is to be held at the Connaught Rooms, London, next Friday, February 18th, at 12.30 for 1 p.m. Mr. S. Johnson, secretary of the Association tells us all tickets for the function are already sold.

Aircraft Finishing

While the framework and infra-red lamps comprising the heating "tunnels" employed for aircraft finishing, as described in our January 14th issue, were supplied by the Metropolitan-Vickers Electrical Co., Ltd., the whole of the associated control equipment was specially designed for the purpose by the Airedale Electrical Manufacturing Co., Ltd., and built in its Bradford works for duty cycles stipulated by the user. The equipment functions entirely automatically, all that is required of the operator being to press buttons on the control panels. Its makers believe this gear to be the first of its particular kind to be manufactured in this country. All the contactors, timing relays and accessories are compactly housed in cubicles forming self-contained units. The oil-immersed circuit-breakers, pedestals, cable boxes and trunking are also of "Airedale" manufacture.

False Time-Sheets

When a director of a firm of electrical contractors visited aerodrome sites he found no one at work, but later time-sheets were sent in for that date. At Norfolk Assizes last week, eight men pleaded guilty to obtaining money from their employers by means of false time-sheets. William Arthur Hemming (58), foreman, was sentenced to six months' imprisonment, and Dennis Piper (36), charge-hand, to four months. Gerald Tourick (19), Stanley Francis White (28), Christopher Kelly (39), James Henry Budd (19), Patrick Kelly (44), and Lawrence Eric Taylor (23), were each bound over for two years.

Trade Announcement

The shares of Northern Factors, Ltd., Crescent Road, Middlesbrough, have been acquired by Kerry's (Great Britain), Ltd. (formerly the East London Rubber Co., Ltd.), who will carry on the business under the same title, as a subsidiary company. Mr. H. E. Robinson, who has been associated with Northern Factors, Ltd., for many years, has been appointed manager, and Mr. W. R. James sales manager. A full range of motor spares, machine and small tools, etc., will be stocked.

Dutch Exports to Turkey

The *Monthly Journal* of the British Chamber of Commerce of Turkey reports that Dutch firms have offered to export electrical and wireless material, including electric motors, against the import of fruit from Turkey.

Calendar

Illustrations of their equipment appear on the calendar with three-monthly sheets sent to us by C. A. Parsons & Co., Ltd.

Change of Name

George Forrest & Son, Ltd., 30, Osbourne Road, Acton, W.3, have changed their name to D. Assersohn, Ltd.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the makers of the following:—

Small lock operated by a key with an electrical switch self-contained in the lock.

Vacation Training

Imperial College Union Scheme

A CONFERENCE of those concerned in the vacation work scheme sponsored by the Imperial College Union has been held to discuss the operation of this means of obtaining closer contact between universities and industry. The scheme, which is officially recognised by the Ministry of Labour, was initiated by students of the Imperial College of Science and Technology, to whom it is open. In 1942–43 there were 488 registrations—about double the immediately pre-war figure. The number of firms and others co-operating has increased to 226 including over 60 connected with the electrical industry.

Among the electrical engineers who contributed to the discussion was Dr. C. C. Paterson (G.E.C. Research Laboratories) who emphasised the value of the scheme to students in widening their outlook and giving them a knowledge of their future fellow workers. He expressed the view that students should get into the shops in any manual worker's capacity on one or two at least of their vacation courses and not be segregated into a special apprentices' department. Participation in research work might be satisfactory for a third but not for a first vacation course. Speaking as a third-year student in electrical engineering, Mr. J. S. M. MacMullan, who had spent two months on production (one or two weeks in each section) followed by two weeks on research, held that the first course should be employed in the obtaining of as general an impression as possible. The insight gained would do much to give a designer a practical outlook.

Mr. P. J. Ridd (G.P.O.) said that students of the Union going to the Post Office generally chose specialised research. They were paid at the general rate for skilled workmen.

Compromise Courses

Mr. K. R. Evans (Metropolitan-Vickers Electrical Co.) considered that each vacation should be spent in a different organisation. He advised a mid-course between rapid movement from section to section and gaining experience in one small department only. A short talk covering various aspects of the industry, followed by a discussion, should be given once or twice a week by senior members of the staff.

After remarking that most of the bigger firms in the electrical industry had been taking vacation students for some years, Mr. C. Grad (British Thomson-Houston Co.) said that his company employed them on one job only, but gave them opportunities of seeing everything by means of works visits in small parties under the guidance of senior technical apprentices and of lectures on all aspects by senior officials, concluding with a critical discussion on engineering training. He regarded vacation work as only an introduction to later works experience, which was necessary as a post-graduate course.

Mr. G. L. Jones (A. C. Cossor, Ltd.) referred to the need to come to an understanding with the trade unions in order to ensure sympathetic welcome to students, only about 10 per cent. of whom at his works were not engaged on production. He pointed out that there was a need for men with second-class degrees and good all-round college records. The universities might usefully get students to consider openings as foremen of the new type which would be required.

Responsibilities of Industry

Dr. A. P. M. Fleming (Metropolitan-Vickers Electrical Co.) spoke of the responsibility of industry, in the national interest, towards the training of students. An organised scheme was essential and he mentioned appreciatively the plan for chemistry students submitted earlier in the discussion by Dr. C. H. Clarke (Lever Bros.). In this scheme the student was allowed a day or two for seeing the works as a whole and then a week in the laboratory; he was then asked to choose the department where he would work (not watch) for a month, which left usually about a week for seeing something of ancillary operations.

Dr. Fleming believed that a student desiring to have post-graduate training should apply his vacations to one or two jobs, by which he would obtain the skilled artisan's point of view. Much benefit was to be obtained from lectures. A vacation course should give a bird's eye view of industry and of the economic aspect of production. In most industries students should keep off research and get down to factory processes. A shorter period than eight weeks was difficult to organise.

Winding up the discussion, Prof. C. L. Fortescue (Dean of the City and Guilds College) thought the appreciation of the value of accuracy obtained in vacation training was of much greater importance than the acquisition of manual dexterity or detailed technical knowledge. The main reason for encouraging such courses, however, was to get "square pegs into square holes in industry." He emphasised that for an engineer vacation work was no substitute for a proper practical training, at least five years of which was necessary before research work could be profitably taken up.

Power Plant Performance

Determination of Standard of Merit

IN opening the discussion on standards of performance of generating plant at the Institution of Electrical Engineers in London, based on five years' operating data presented by Messrs. Biles and Maxfield in a paper referred to in our last issue, the importance of the subject was stressed by Mr. J. R. Beard (Merz & McLellan), who remarked that there had been a tendency to camouflage too many past failures.

The financial aspect of the problems dealt with in the paper was very important. To take a very rough figure, in the 1938-39 statistics, the working cost was given as about £19,500,000, of which about three-quarters was for coal. Since then, output had increased by about 50 per cent. and the price of coal had been about doubled. Therefore, at the present moment, station operators had in their charge the efficient utilisation of about £30,000,000 worth of coal per annum. There was also something like £200,000,000 of capital sunk in power station plant on which charges had to be paid and the use of which depended very much on availability. Therefore, very slight improvements in efficiency and availability represented very considerable sums from the national point of view.

The authors had quite rightly definitely gone down to fundamental facts and the importance of that was demonstrated by the Electricity Commissioners' statistics, which had had a very valuable influence on power station design and operation, but the fundamental thing in power generation was the lowest cost of electricity delivered to the mains. It was true to say that, to some extent, the emphasis placed on thermal efficiency had tended to detract from consideration of the more fundamental requirements of electricity generation.

"Certain Complications"

While there was very much to be said for the authors' method of comparing the actual operating efficiency with what they thought ought to be obtained under normally good conditions, it had certain complications which the paper tended to skate over. For example, where were the steam pipe losses and blow-downs brought in? Presumably they must be taken into account in the curve for converting from the ideal efficiency to the expected efficiency at 80 per cent. load factor, but surely they were not entirely controlled. Again, he did not see why the efficiency one should expect to get should be anchored to the particular year in which the plant was installed, and there was also the factor of the variability of coal.

As regarded availability, although the authors had done an enormous service in bringing this forward in a statistical form, he was very surprised to note that when the boiler capacity was higher than the turbine capacity it was reckoned on the higher of the two figures. It was a curious argument that a station which had tried to maintain a level output by providing spare boiler capacity should be deprived of any credit for the advantages so gained. Under present conditions, whatever might be the case in the future, a certain amount of spare boiler capacity was a very profitable investment. The proposed standard of merit seemed to be the product of two entirely different and separate matters and was, therefore, an extremely artificial expression.

Coal Specifications

Mr. J. D. Peattie (Central Electricity Board) said he knew the authors had had very good success with the application of the principle set out in the paper in their own area, and it was to be hoped that the interest it had aroused among power station engineers there would spread all over the country. The paper referred to a section of plant in stations under the control of the C.E.B., but it was only about 10 per cent. of the whole.

It was to be hoped that through the aid of more precise measurements in the stations themselves, the hand of the coal interests would be forced and a more precise specification for coal arrived at. The Electricity Commissioners' statistics had focused attention on thermal efficiency, but while those at the top set the pace, the total performance of the group depended on the average as well as on the top ones.

Some of the low operating efficiencies were due to causes quite outside the control of the operating staff; they might depend on the design of the station or of some particular parts of the plant. Therefore, it was necessary to analyse all the losses and the table in the paper showing how to do that was one of the most important parts of it. The authors' proposed standard of merit was satisfactory as a starting point, but it was a rather curious proceeding to multiply two percentages which bore very little relation to each other and get another percentage.

Mr. C. G. Carruthers (Kennedy & Donkin) said that as the greater number of shut-downs, according to the paper, were of less than one day's duration, and only in rare cases had the period been as long as four days or more, tidal schemes which were now receiving so much attention might afford relief at week-

ends to facilitate maintenance. In their choice of an ideal thermal efficiency, the authors' use of a cycle of feed heating in stages of 50 deg. F. did not appear to be a very representative increment; in actual practice, and certainly in America, increments of 75 deg. F. and even 100 deg. F. were used. No reference was made to excess air as a source of low efficiency. Had the authors omitted it because they considered that the quest of high CO_2 might lead to high efficiency at the expense of overheated stokers and settings?

Mr. H. V. Pugh (South Wales Electric Power Co.), who is connected with one of the stations included in the paper, said that a large measure of success had been obtained in the area by the methods adopted. The authors' aim had been, in essence, to produce a method of comparison which would enable the operators in smaller stations to compare their results with those of the bigger stations.

In one station approximately 47,000 tons of coal of 47 different varieties was burned last month. The ash content varied from about 9 to 28 per cent. and the volatile from 10 to 21 per cent. Frequently it was not known the fuel was coming until it arrived and then the wagons had to be emptied in 24 hours and an endeavour made to control the flow to the bunkers to get fairly reasonable results. With 60,000-lb. boilers first put into commission in 1925 and 1927, four in each case, an availability for the years 1941, 1942 and 1943 of 91·15, 90·98 and 89·65 per cent. respectively was obtained. With more modern pulverised-fuel fired boilers having a capacity of 182,000 lb. the average during the same three years had been 92 per cent. While design had a great influence on availability, full credit should be given to the operators.

Turbine and Boiler Availability

Mr. S. M. Hill (Bristol Electricity Department) said it was not exceptional for a turbine to have an availability of 95 per cent., whereas it was seldom that a boiler had an availability of more than 85 per cent. The authors' figures of excess of steam over the turbine consumption did not seem to give the requisite opportunity for adequate maintenance; lack of output of stations was generally due to lack of boiler plant. On the subject of coal, although the paper gave the proportion of fines as 18 per cent. in 1942, it was in the region of 50 per cent. to-day.

Mr. A. R. Cooper said that in the area dealt with the net effect of unsuitable fuels (not necessarily bad fuels) was to nullify a capital expenditure of about £1,500,000 and, in addition, still more coal had to be supplied to meet the demand made by the electricity supply industry. Increasing the load factor on a generating station usually raised its thermal efficiency, but increasing the load factor on an interconnected system, such as a C.E.B. area, usually reduced the thermal efficiency, because the less efficient plant became more heavily loaded. Caution should be exercised in drawing conclusions from Fig. 8 in the paper. The inference to be drawn from the curves was that a better economic performance could be expected from modern plant than from older plant. If this assumption was correct, it was very comforting because it suggested that the industry and manufacturers were benefiting from past experience and that, in total, a steady rate of progress was being maintained. There was, however, sufficient evidence available to show that this was not a safe generalisation for the country as a whole. In comparing performance of stations, some account should be taken of the numbers and remuneration of the personnel engaged in producing higher availability. There were dangers in basing decisions on statistics alone.

Load Factor and Efficiency

Mr. R. A. W. Connor (Luton Electricity Department) said there was need for a standard code of practice for evaluating the efficiency of power stations. The authors' Fig. 5 showed load factor to vary in a somewhat consistent manner with sizes of station the turbine capacity of which varied from 5 to 50 MW. Curves showing the operating efficiency determined by the method suggested by Mr. Beard compared with the plant load factor, however, were very erratic in shape and supported the contention that there was no fixed relationship between load factor and operation efficiency. Why had the authors based their thermal efficiency curve in Fig. 6 on units generated? The Commissioners based all figures on units output, which was the modern tendency. As to the figure of merit, he agreed that it was difficult to multiply load factor by an availability factor. However, it seemed to be the only thing to be done, but instead of using the correction factor suggested the operation efficiency should be multiplied by the plant item efficiency and the product multiplied by the exciter efficiency and then again by an availability factor, which would exclude the allowance for annual overhauls—and call that the factor of merit.

Mr. E. T. G. Emery (London Power Co.) said that in the calculation of maximum probable efficiency, the authors included vacuum as one of the factors to be taken into account. If the object of the proposed calculations was to assess the effects of poor operation, surely the fouling of condensers should be taken into account and circulating water temperature should be substituted for vacuum. There were other methods of calculating "maximum probable efficiency" which should be worked out for each case. In all the methods, one of the given quantities was the final feed water temperature, but this

varied with the plant load factor. If the authors could suggest any practical method of determining what the optimum final feed temperature would be, this value could be used in all calculations irrespective of the final feed temperature actually produced.

Mr. E. McCabe said that the operating figure shared with the thermal efficiency figure the disadvantage of being, in all probability, less accurate than its least accurate factor. One of the major sources of inaccuracy was the errors which could arise in arriving at the fundamental factor of heat input; careless sampling of coal might lead to errors of from 2 to 5 per cent. in the final result. Moisture determinations might be equally inaccurate. Coal weights determined at the colliery, might be appreciably different from the weight actually fed to the boilers.

Mr. Maxfield, in the course of a short reply, said that so many outstanding questions had been raised that he would like to defer replying to some of them until there had been sufficient time to reach definite conclusions. He emphasised that in the general investigation of operation efficiency and availability the authors had wished to arrive at some index which would be a merit figure for the operation of the station. The same applied to availability. If as a result of the application of this system there was a revival of enthusiasm in the second-grade stations, the effort would have been well worth while.

Colliery Power Needs

Possible Post-War Developments

THERE is likely to be a big increase in the consumption of electricity both on the surface and below ground at coal mines after the war. To enable some idea to be formed of the potential demand, the load of a typical group of collieries is analysed by Mr. B. L. Metcalf (Powell Duffryn Associated Collieries, Ltd.) in a paper submitted to the transmission Section of the Institution of Electrical Engineers.

The paper is concerned mainly with the transmission and distribution of power, pit-head generation being touched upon only in so far as it affects general problems associated with the former aspects. Some notes are included on the choice of switchgear and on the influence of that choice on the proposed amendment of the Regulations for the Use of Electricity in Mines. The electrification of collieries in any area would be simplified and cheapened by greater standardisation and the author outlines recommendations in respect of sizes of switchgear, transformers, compressors, haulages, winder drums, cable sizes, voltages and transmission line cross-arms. A new design of cross-arm for a single-circuit 33-kV overhead line is illustrated.

Continuity of supply is of vital importance to collieries, for which reason alone they are justified in retaining a reasonable capacity of generating plant at the pit-head to maintain essential services in the event of major interruptions of supplies from outside. But amalgamations and growth of load render the colliery companies' own plants inadequate to meet the total demands. Very few satisfactory arrangements have been made for working colliery generating plant in parallel with the grid or with power companies' systems; nor have the colliery loads, which are continually increasing, been properly co-ordinated with the other industrial loads in the same areas. On the other hand collieries can usefully generate electricity as a by-product of their normal business and their potential contribution must be taken into account.

In the South Wales coalfield, where the 1934 output was just over 35 million tons, or 15·8 per cent. of the total United Kingdom output, special problems are involved in the transmission and distribution of power because of the concentration of collieries in narrow valleys and the hilly country which must be crossed by the power lines. The two main factors that tend to increase the power consumption per ton of coal raised relative to other areas are the heavy pumping load and the extensive use of compressed air. This means that four or five times the power must be generated on the surface for compressed-air drives as compared with direct electric drives.

A fair average figure for power consumption in the South Wales steam and bituminous coal mines is 35 kWh per ton, including power for the washeries. If all the collieries in the area were completely electrified, including compressors, winders, fans, etc., the total annual consumption would be 1,050 million kWh at an average load factor of 45 per cent., representing a maximum demand of approximately 270,000 kW.

With modern generating plant it is possible to deliver 1 kWh to the colliery 3·3 kV busbars for 1·5 lb. of coal burned, or a total of 703,000 tons per annum for 30 million tons of coal raised, which represents 2·35 per cent. of the coal raised. If the electricity consumption were 45 kWh per ton the proportion of coal burned to that raised would still be only 3 per cent. It is not too optimistic to suggest that the consumption of coal per ton raised could be reduced to at least half the present figure.

ELECTRICITY SUPPLY

Brighton Breakdown. Norwich Scheme Approved.

Aberdeen.—STARLIGHTING PROPOSAL.—After experimenting with "starlighting" the Watching and Lighting Committee has recommended the placing of an order for 100 fittings to be installed at key points in the main thoroughfares of the city.

Birkenhead.—STREET LIGHTING.—The Finance Committee has asked the Gas and Electricity Committees to hold a joint meeting to deal with the question of street lighting, particularly with regard to the present equipment and methods of control.

SUPPLY EXTENSIONS.—At a cost of £2,929 the Electricity Committee is to provide electricity supplies to Clatterbridge emergency hospital and to a waterworks.

Brighton.—ELECTRICITY BREAKDOWN.—For half an hour on February 1st, the town was in complete darkness, and all the trolley-buses were at a standstill as the result of an electricity breakdown which affected the whole of the Brighton area. The interruption occurred between 9.35 and 9.40 p.m., and it was not until 10.5 p.m. that a partial supply was resumed. Full supply recommenced at 10.10 p.m.

East Anglia. — BULK SUPPLY FAILURE. — A bulk supply failure over a large area of Suffolk and Norfolk on Monday night is reported to have been caused by an aeroplane striking an overhead line. Towns affected include Ipswich, Stowmarket and Framlingham. The supply was restored in the Ipswich area in about fifteen minutes, but some parts were without a supply for several hours.

Halifax.—PLANS FOR LIGHTING IN 1944-45.—A detailed programme for immediate post-war street lighting, on the assumption that such lighting will be possible during the winter of 1944-45, is to be prepared by the public lighting superintendent. The Watch Committee has also approved of the Lighting Sub-Committee's recommendations to prepare lamps at main street junctions ready for immediate normal lighting and to include a sum of £1,250 for equipment in next year's estimates.

Hull.—MODEL HOUSES.—The city architect has been asked by the Electricity Committee to collaborate with its officials in the production of the model houses proposed by the Housing Committee.

LOANS. — The Electricity Committee has obtained sanction to borrow £1,337 for substation equipment and is seeking sanction to borrow £843,249 for post-war extensions at Sculcoates power station.

Ipswich.—METER READING EXPERIMENT.—In a letter to the *East Anglian Daily Times*, Mr. G. A. Vowles, chief engineer and manager of the Ipswich Electricity Department, records the results of a meter reading experiment. Where the meter readers were unable to obtain admission through the occupiers being out, printed postcards were left with a request that the meter readings should be inserted and the cards returned to the Department. Altogether 720 cards were left and there were 342 replies with the necessary information.

London.—SATISFACTORY YEAR'S WORKING.—With regard to the results of the operations of the St. Pancras electricity undertaking for the year ended March 31st, 1943—its fifty-first complete year—the Electricity Committee expresses the opinion that the results achieved are extremely satisfactory, taking into account wartime conditions.

Manchester. — EXTENSION. — The Electricity Committee is to proceed with extensions and modifications to the 33-kV transmission and transforming system.

Nelson.—LOAN.—The Town Council has approved an application for sanction to borrow £1,000 for new electricity mains and services.

Norwich. — RURAL ELECTRIFICATION. — The City Council has unanimously approved the scheme described in our issue of November 19th, 1943, for the complete electrification of the rural area. Work will start as soon as times become propitious, though in the meantime portions of the scheme are being proceeded with as certificates are received from the War Agricultural Executive Committee for supplying farms.

Nottingham.—SEPARATE LIGHTING COMMITTEE.—Hitherto the lighting of the city has been under the direction of a committee drawn from members of the Gas Committee. The City Council has now been recommended by the Finance and General Purposes Committee to appoint a separate Lighting Committee and for the time being it is proposed that the members shall consist of the chairmen and vice-chairmen of the Electricity, Finance and General Purposes, Gas, Works and Ways, and Watch Committees.

Paisley. — PREPARING FOR PEACE. — The *Paisley Daily Express* reports that members of the Watching and Lighting Committee of the Town Council attended a demonstration of various types of street lamps at the electricity works, Blackhall, last week. Sodium, mercury and tungsten lamps were on view. The demonstration was with the object of deciding on the most suitable type of street lighting to be installed after the war, and in order to have the necessary equipment ready.

Stockport.—RATE RELIEF.—The Electricity and Transport Committees have each agreed to make the usual contribution of £10,000 for rate relief.

Worthing.—ARREARS OF HIRE CHARGES.—Arrears of cooker hire charges are reported to have shown a tendency to increase. The Electricity Committee proposes to inform defaulting consumers that in view of the man-power position the Corporation will be unable to enter into fresh agreements for restoration of the apparatus during the period of the war if the cookers are disconnected for non-payment of hire charges.

York.—CONTRIBUTION TO RATES.—The City Electricity Committee has offered to contribute a further £4,000 to the general rates, making a total of £8,000 for the year. The Finance Committee has, however, recommended that this amount should be raised by a further £5,000, making a total of £13,000.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

Westinghouse Brake & Signal Co., Ltd.—After making provision for E.P.T. the profit for the year ended September 30th is practically the same as in the previous year—£416,681 as against £416,670. Depreciation takes £51,633 (£53,105), directors' fees £2,929 (£3,000) and provision for income tax £188,845 (£195,854), leaving a net profit of £173,274 (£164,711). A sum of £15,000 (£10,000) goes to staff pensions, and contingencies again account for £80,000. A first and final dividend of 10 per cent. (same) plus a cash bonus of 4 per cent. (2½ per cent.), making 14½ per cent. (12½ per cent.) takes £78,566 (£70,148), leaving £95,544 (£95,836) to be carried forward. Total assets have increased from £2,944,076 to £3,514,199.

The Bagdad Light & Power Co., Ltd., reports a gross revenue for 1942 of £178,380, as compared with £148,588 in the previous year. Generation costs take £24,055 (£19,876), distribution £12,905 (£12,244), management expenses £13,415 (£12,772), directors' fees £3,000 (£1,867) and sundries £327 (£267), leaving a balance of £124,676 (£101,562). After allocating £25,500 (£25,100) to depreciation, £673 (nil) to enemy debts, and £90,118 (£56,299) to British taxation, Iraq share in profits and contingencies, and paying a dividend of 2½ per cent. (5 per cent.), tax free, £8,666 (£10,570) is carried forward.

The Electrical & Industrial Investment Co., Ltd., reports a revenue for the year ended December 31st last of £54,584, as compared with £54,106 in the previous year. Management expenses amount to £1,807 (£1,798), directors' fees £1,500 (same), taxation £20,352 (£19,996) and debenture interest £9,750 (same), leaving £21,175 (£21,062). After paying a dividend of 12 per cent. (same) on the deferred ordinary shares there is a balance of £8,675 (£8,562).

Dublin United Transport Co., Ltd.—An offer by the Government of Eire of £14 10s. nominal 3 per cent. debenture stock in a new statutory transport company for every £10 of stock on compulsory acquisition was discussed at a recent adjourned meeting of stockholders. Several strongly opposed acceptance and a ballot was taken, the result of which is to be announced at a special meeting.

Radio Rentals, Ltd., are to pay a final dividend of 15 per cent. against 6 per cent., making 20 per cent. (10 per cent.) for the year. The profit for the year ended August 31st last, after providing for depreciation and N.D.C., but excluding income tax, is £112,364 (£74,900).

British Rola, Ltd., reports a net profit of £39,237 for the year ended March 31st last, against £16,045. The ordinary dividend is raised from 8⅓ per cent. to 15 per cent.

The London Electric Supply Corporation, Ltd., has declared an ordinary dividend of 6 per cent. in respect of the past year (same).

New Companies

De La Rue Insulation, Ltd.—Private company. Registered January 27th. Capital, £300,000. Objects: To acquire (1) that branch of the business of De La Rue Plastics, Ltd., which comprises the manufacture, use and sale of laminated insulation material and laminated board; and (2) all or part of the assets, liabilities and undertakings of Hammans Industries, Ltd., the Hamofil Manufacturing Co., Ltd., and Insulande, Ltd., and to carry on the business of manufacturers of, and dealers in, insulating material, natural and synthetic plastics, laminated board, moulding materials, chemical and other substances and compounds, moulded goods, filling compounds, fire and acid-proof materials, electrical and photographic goods, etc. Subscribers: A. J. Penwarden, 11, Northumberland Avenue, Romford, Essex; and A. Byron, 21, The Park, Ealing, W.5. Registered office: Avenue Works, Walthamstow Avenue, E.4.

Pennine Distributors, Ltd.—Private company. Registered January 26th. Capital, £5,000. Objects: To carry on the business of manufacturers and repairers of, agents for and dealers in wireless and television sets and accessories, lighting apparatus, electrical fittings and appliances, vacuum cleaners, refrigerators, etc.; to finance hire-purchase agents, etc. Subscribers: H. Brodrick, 8, Rowsley Road, St. Annes-on-Sea; and S. Turner, 11, Greenwood Avenue, Blackpool. Secretary: S. Turner. Registered office: 10, Edward Street, Blackpool.

Northern Electrical Rewinds, Ltd.—Private company. Registered January 27th. Capital, £500. Objects: To carry on the business of armature re-winders, manufacturers of, and dealers in, electrical and radio windings, batteries, accumulators, apparatus and accessories, motor engineers, etc. Subscribers: J. Reed, Sun Buildings, Winchester Street, South Shields; and G. J. Hutchinson, 358, Sunderland Road, South Shields. Solicitors: Newlands, Newlands and Patterson, South Shields.

Volta Electric, Ltd.—Private company. Registered January 28th. Capital, £10,000. Objects: To carry on the business of manufacturers, importers, exporters, purchasers and vendors of, and dealers in, electrical equipment; wireless and television dealers, etc. Subscribers: S. A. Boyd, 33, Rodney Gardens, Eastcote, Pinner, Middlesex; and G. Devisse, 10, Edgwarebury Gardens, Edgware. Registered office: Cunard House, 88, Leadenhall Street, E.C.3.

R. Waring, Ltd.—Private company. Registered January 28th. Capital, £800. Objects: To carry on the business of manufacturers of, and dealers in, gramophones, sound and picture-producing reproducing or transmitting apparatus, accumulators, batteries, loud-speakers, transformers, wireless and electrical components and accessories, etc. Directors: R.

Waring, Ethel Waring, Edith Dickinson and J. H. Dickinson, all of 14, Carr Gate, Cleveleys, Lancs. Registered office: Victoria Buildings, Victoria Square, Cleveleys, Lancs.

S. Eaton & Sons, Ltd.—Private company. Registered January 27th. Capital, £2,000. Objects: To acquire the business of manufacturers and exporters of gas and electric fittings and lamps and importers of illuminating glassware, carried on by Mabel M. Semark and Desmond S. Eaton as S. Eaton & Sons, at 64, Barr Street, Birmingham. Directors: Mabel M. Semark and D. S. Eaton, both of 71, Sir Harry's Road, Edgbaston, Birmingham; and L. Jackson, 44, Goodrest Croft, Yardley Wood, Birmingham, 14, manager. Registered office: 64/8, Barr Street, Birmingham.

Bridgman, Courtney, Ltd.—Private company. Registered January 24th. Capital, £1,500. Objects: To carry on the business of electrical, motor and general engineers, etc. Subscribers: E. G. Bridgman, 1, Ellerton Lodge, East End Road, N.3; and J. B. Bridgman, 72, Western Avenue, East Acton, W.3. Solicitors: Titmus, Sainer & Webb, E.C.4.

Fine Wires, Ltd.—Private company. Registered January 29th. Capital, £100. Objects: To carry on the business of fine wire manufacturers, wire weavers, drawers and workers, mechanical and electrical engineers, etc. Subscribers: P. E. F. Clay, Green Roofs, Radcliffe-on-Trent, Notts; and Wm. H. Stewart, 9, Burnside Road, West Bridgford, Nottingham. Secretary: W. H. Stewart.

Ford's Engineers (Brighton), Ltd.—Private company. Registered January 20th. Capital, £500. Objects: To acquire the business carried on as Ford's Engineering Works, at 6, Russell Crescent, Brighton, and to carry on the business of electrical, marine and general engineers, etc. Directors: H. Ford, Good Companions Hotel, Dyke Road, Brighton; H. Hart, 17, Friar Road, Brighton; and C. Thomas, Crowsnest, Barrowfield Estate, Hove. Registered office: 6, Russell Crescent, Brighton.

Edwards & Son (Brighton), Ltd.—Private company. Registered January 31st. Capital, £3,000. Objects: To carry on the business of manufacturers and repairers of, and dealers in, electrical and mechanical apparatus and accessories, electric stoves and lighting fittings, wireless and television sets and valves, gramophones, etc. Directors: Sarah Edwards, 2, Preston Road, and W. J. Scott, 58, Stanley Road, Brighton. Registered office: 67, London Road, Brighton.

Companies' Returns

Statements of Capital

Adamson Green & Co., Ltd.—Capital, £5,000 in £1 shares. Return dated October 14th. 900 shares taken up. £900 paid. Mortgages and charges: Nil.

Bushing Co., Ltd.—Capital, £100,000 in £1 shares. Return dated November 12th, 80,000 shares taken up. £80,000 paid. Mortgages and charges: Nil.

Atlas Electric and General Trust, Ltd.—£6,500,000 in £1 shares (3,000,000 preference, 3,000,000 ordinary and 500,000 unclassified). Return dated October 27th (filed November 26th). 3,000,000 preference and 3,000,000 ordinary shares taken up. £1,749,078 paid. £4,250,922 considered as paid. Mortgages and charges: £750,000.

Increases of Capital

British Switchgear Corpn., Ltd.—The nominal capital has been increased by the addition of £900 beyond the registered capital of £100. The additional capital is divided into 18,000 ordinary shares of 1s. each, ranking *pari passu* with existing ordinary shares.

B. G. Suthers, Ltd.—The nominal capital has been increased by the addition of £3,500 beyond the registered capital of £1,500. The additional capital is divided into 3,500 six per cent. non-redeemable cumulative preference shares of £1 each.

Mortgages and Charges

India Rubber Gutta Percha & Telegraph Works Co., Ltd.—(a) Deed of security, dated December 21st, 1934 (by way of legal mortgage), and (b) supplemental deed of security, dated March 31st, 1935, charged on 87/115 (odd), Carlisle Street; 82/96 (even), Princess Street, 1/14, Hatton Street; 81/9 (odd), North Street, and 1/8, Jeffs Place, all in Marylebone, with plant and machinery thereon (being property acquired by the company on December 31st, 1943). Amount owing: £110,590 12s. 6d. Registered pursuant to Section 81 of the Companies Act, 1929. Mortgagees: Prudential Assurance Co., Ltd.

Arc Manufacturing Co., Ltd.—Debenture, charged on certain freehold and leasehold property, and the company's undertaking and other property, present and future, including uncalled capital, dated January 20th, to secure £15,000 (ranking *pari passu* with existing debentures for £3,000 £7,000 and £25,000). Holders: Branch Nominees, Ltd.

Insulating Materials, Ltd.—Mortgage on Park Works, Appleton, Widnes, Lancs, dated July 2nd, 1939, to secure £1,800. Holders: Miss M. T. Hayes, 5, Grange Lane, Winsford, Cheshire, and another. (Registered January 22nd, by permission of the Court.)

Birmingham Power Transmissions, Ltd.—Mortgage on leasehold land and premises known as 58/62, Miller Street, Birmingham 6, with machinery and fixtures, dated January 12th, to secure all moneys due or to become due from the company to Midland Bank, Ltd.

Bell & Harwood, Ltd.—Mortgage on 20-27, Duke Street, Birmingham, dated December 31st, 1943, to secure £9,500. Holders: Arthur Lee & Sons, Ltd., Sheffield.

Liquidations

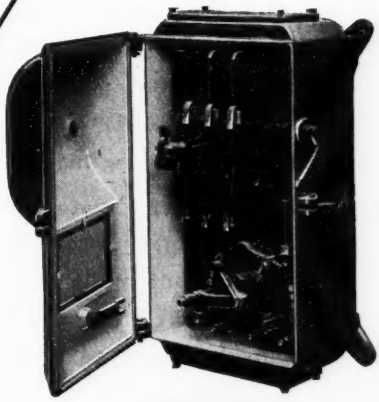
Unwin-Soar, Ltd.—Winding up voluntarily. Liquidator, Mr. P. Cardwell, 93, Queen Street, Sheffield, 1.

Bankruptcies

A. F. Peacock, radio engineer, 15, Bank Street, Teignmouth.—Last day for receiving proofs for dividend February 22nd. Trustee, Mr. H. Wheeler, 26, Baldwin Street, Bristol, Official Receiver.

THE VERITY RANGE

MOTORS



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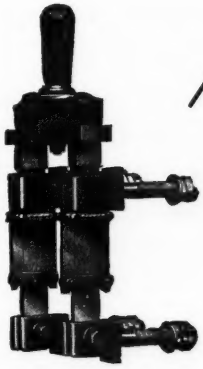

SWITCHGEAR

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Reversing drive problem solved by "TRISLOT" motor

A certain reversing drive (continuous, automatic control, approximately 20 seconds per cycle) had proved too severe for either normal squirrel cage reversing motors or slip-ring motors with permanent rotor resistance.

A two-speed High Torque Low-Current "Trislot" squirrel cage motor, 20/15 H.P. at 1000/500 R.P.M., was installed in place of two slip-ring motors of 30 H.P., 1500 R.P.M. and 15 H.P., 750 R.P.M. This motor has now run for several years on 24-hour shifts with complete success and shows a saving of over 25% in power consumption in comparison with the slip-ring motors.

The "Trislot" motor will take the place of a slip-ring motor in many instances, with the advantages of greater simplicity of motor and control gear (the latter being particularly important in the case of automatically controlled plant), and often reduced running costs.

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STOCKS AND SHARES

TUESDAY EVENING.

PUBLIC interest in Stock Exchange markets remains subservient to the attention which is fixed upon invasion possibilities. War news is considered good. Gilt-edged securities keep firm, with rising prices in the quotations for trustee securities. The policy recommended by the electrical associations, for organised co-operation in the electricity supply world, aroused keen interest, but so far has failed to influence prices of stocks and shares in companies connected with the industry.

Standard Low Voltage

The far-reaching plan proposed by the Post-war Planning Committee of the Institution of Electrical Engineers advocates the adoption for the nation of a standard low-voltage system of electricity supply. It has led to not a little discussion. From the immediate point of view it has had no effect upon the prices of Stock Exchange securities, although if anything of this nature were to come within the pale of practical politics, no doubt the manufacturing and equipment companies would stand to benefit considerably. Notice has been drawn here, on many previous occasions, to what seems to be the high range of prices attained by shares in the front-rank companies connected with this branch of industry, prices which are mainly explained by reference to the post-war prospects of the companies.

Post-War Planning

The plan just mentioned visualises the expenditure of £17½ million and is recommended as an urgent post-war necessity. Five years is the estimate of the time required for complete standardisation. Whether anything comes of this particular scheme or not, it is obvious that the provision of cheap electricity, throughout the country as a whole, is going to be one of the first matters which will come under consideration in post-war planning. The companies engaged in it will secure sufficient employment to keep them profitably engaged for years to come.

Electricity Supply Shares

Half a score of rises, and no falls, in Home electricity supply shares make effective comment upon the plans and schemes submitted for the post-war governance of the industry. Yorkshire Electrics are now up to 44s., a gain of 1s. 6d. on the week. Electrical Distribution of Yorkshire are up 1s. to 45s., and rises of similar amount have occurred in Lancashires, North Eastern Electrics and both the Midland shares. Of the London companies, City " Lights " and Metropolitans have been wanted. Scottish Power crossed the border of £2. Clyde Valley hold their previous firmness at 42s. A number of the 6 per cent. preference are about 6d. better, but in many cases the market is so meagrely supplied with shares that to sell is easier than to buy them.

Few changes have taken place in the overseas shares. Tokyo Electric " sixes " at 19 are a point higher, for what seems to be the rather anomalous reason of American successes in the Southern Pacific. Atlas Electric fell back 9d., to 5s. 9d.

Advancing Prices

Last week's gains in the equipment and manufacturing group are mostly held, and improvements now to be noted include General Electrics and Murex, both $\frac{1}{16}$ up, at 91s. 3d. and 101s. 3d. respectively. English Electrics are within a few pence of 2½. Johnson & Phillips have hardened to 69s. 6d., Automatic Telephones to 58s. 9d., Telegraph Constructions to 51s., and Associated Electricals to 51s. 3d. Thorn Electric at 22s. 6d. have gained 3s. Burco and Falk Stadelmann are similarly better. Vactrics are dull, the price having gone back 9d. to 12s. 9d. British Insulated and Callender's are easier. Investment turns renewed attention to shares in some of the " heavy " industries. Vickers, for example, show 1s. advance to 18s. 6d. The time approaches for the company's dividend declaration, and at 18s. 6d. the present-paid dividend of 10 per cent. gives a yield of £5 11s. per cent. on the money. Babcock & Wilcox are unchanged at 50s., at which the return comes to £4 8s. on the basis of the 11 per cent. dividend now being paid. Babcocks are £1 shares, Vickers, 10s.

Miscellaneous Matters

Market buoyancy in Argentine issues, inspired by the Republic's rupture with the Axis Powers, subsided after a few days. Some of the prices held rises secured when the news was first made known, but Anglo-Argentine Trams went back, and the 4 per cent. income debenture—which, after all, is only a gambling counter—fell two points to seven. Brazilians have met with support, though the price of Brazilian Tractions remains dull at 25¼, on fears of increased taxation. Cape Electric Trams are a florin better at 26s. The Thomas Tilling figures, for the year just ended, constitute a record. The dividend rate of 10 per cent. for the year is repeated and the price is 6d. higher at 56s. This gives a yield, allowing for inclusion of the dividend, of £3 12s. 9d. per cent. Kalgoorlie Electric Power shares, at 10s., are unaffected by the Corporation's statement that a strike of Wood Line employees having occurred, the supply of wood fuel to the Corporation has been interrupted. In con-

(*Continued on page* 211)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend Previous	Dividend Last	Middle Price Feb. 8	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies					
Bournemouth and Poole	12½	12½	62/6	..	4 0 0
British Power and Light	6	7	33/–	..	4 4 10
City of London	7	7	28/6	+6d.	4 18 3
Clyde Valley	8	8	42/–	..	3 16 0
County of London	8	8	41/6	..	3 17 0
Edmundsons:					
7% Pref.	7	7	34/–	..	4 2 4
Ord.	6	6	29/–	..	4 2 9
Elec.Dis.Yorkshire	9	9	45/–	+1/–	4 0 0
Elec. Fin. and Securities	12½	12½	55/–	..	4 11 0
Elec. Supply Corporation	10	10	47/–	..	4 5 0
Isle of Thanet	Nil	Nil	18/–	..	—
Lancs. Light and Power	7½	7½	37/–	+1/–	4 1 1
Llanelly Elec.	5½	6	25/–	..	4 16 0
Lond.Assoc.Electric	4	3	24/–	..	2 10 0
London Electric	6	6	28/–	..	4 5 9
LondonPowerRed. Deb.	5	5	104½	..	4 15 7
Metropolitan E.S.	8	8	42/–	+6d.	3 16 0
Midland Counties	8	8	40/6	+1/–	3 19 0
Mid. Elec. Power	9	9	44/–	+1/–	4 3 9
Newcastle Elec.	7	7	31/–	..	4 10 5
North Eastern Elec.:					
Ordinary	7	7	34/–	+1/–	4 2 4
7% Pref.	7	7	35/–	+6d.	4 0 0
Northampton	10	10	48/–	..	4 3 4
Notting Hill 6% Pref. (£10)	6	Nil	11	..	—
Northmet Power:					
Ordinary	7	7	38/6	+6d.	3 12 8
6% Pref.	6	6	30/6	..	3 18 8
Richmond Elec.	6	6	26/–	..	4 12 4
Scottish Power	8	8	40/6	+6d.	3 19 0
Southern Areas	5	5	22/6	..	4 9 0
South London	7	7	27/–	..	5 3 8
West Devon	5	5	23/6	..	4 5 0
West Glos.	4½	3½	24/–	..	2 18 4
Yorkshire Elec.	8	8	44/–	+1/6	3 12 9
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	5/9	–9d.	—
Calcutta Elec.	7*	6*	38/–	..	3 3 2
Cawnpore Elec.	10	10	35/–	..	5 14 3
East African Power	7	7	33/–	..	4 4 10
Jerusalem Elec.	7	5	28/6	..	3 10 2
Kalgoorlie (10/–)	5	5	10/–	..	5 0 0
Madras Elec.	4*	Nil	23/6	..	—
Montreal Power	1½	1½	24	..	6 5 0
Palestine Elec."A"	4*	5*	40/3	..	2 9 10
Perak Hydro-elec.	6	7	10/–	..	—
Shawinigan Power	83cts.	90cts.	17	..	—
Tokyo Elec. 6%	6	6	18	+1	—
VictoriaFallsPower	15	15	4¾	..	3 8 7
Whitehall Inv.Pref.	—	6	24/–	..	5 0 0

Company	Dividend Previous	Dividend Last	Middle Price Feb. 8	Rise or Fall	Yield p.c. £ s. d.
Public Boards					
Central Electricity:					
1955 60 Civil Defence)	—	2	100	..	3 0 0
1955–75	5	5	115	..	4 7 0
1051–73	4½	4½	107	..	4 4 1
1963–93	3½	3½	103	..	3 8 0
1974–94	3½	3½	100	..	3 5 0
London Elec.Trans. Ltd.	2½	2½	97	..	2 11 3
London & Home Counties1955–75	4½	4½	112	..	4 0 4
Lond.Pass.Trans.:					
A	4½	4½	120½	+1	3 14 8
B	5	5	120½	+1	4 3 0
C	2⅞	3	66	..	4 11 0
WestMidlandsJ.E.A. 1948–68	5	5	109	..	4 11 9
Telegraph and Telephone					
Anglo-Am. Tel.:					
Pref.	6	6	116	..	5 3 5
Def.	1½	1½	28	..	5 7 2
Anglo-Portuguese	8	8	24/–	..	6 13 4
Cable & Wireless:					
5½ Pref.	5½	5½	113	..	4 17 0
Ord.	4	4	79	..	5 1 3
CanadianMarconi$1	Nil	4cts.	8/6	..	—
Globe Tel.& Tel.:					
Ord.	8¼*	5*	36/6	..	2 14 9
Pref.	6	6	30/–	..	4 0 0
Great NorthernTel. (£10)	Nil	Nil	21½	–1	—
Inter. Tel. & Tel.	Nil	Nil	16	+1	—
Marconi-Marine	7½	7½	33/–	..	4 11 0
Oriental Tel. Ord.	16	10	44/–	–6d.	—
Telephone Props.	6	Nil	17/–	–6d.	—
Tele.Rentals(5/–)	10	10	11/6	..	4 7 0
Traction and Transport					
Anglo-Arg.Trans.:					
First Pref. (£5)	Nil	Nil	2/6	..	—
4% Inc.	Nil	Nil	7	+2	—
Brit.Elec.Traction:					
Def. Ord.	45	45	1085	..	4 2 7
Pref. Ord.	8	8	175	..	4 11 5
Bristol Trams	10	10	52/6	..	3 16 2
Brazil Traction	$1	$1⅛	25½	+⅛	6 18 7
Calcutta Trams.	5½	6½	37/6	+6d.	3 9 5
Cape Elec. Trams	5	6	26/–	+2/–	4 12 4
Lancs. Transport	10	10	44/3	..	4 10 4
Mexican Light:					
1st Bonds	5	5	102½	..	4 17 7
Rio 5% Bonds	5	5	104½	..	4 15 9
Southern Rly.:					
5% Prefd.	5	5	77½	..	6 9 0
5% Pref.	5	5	119	+½	4 4 0
T. Tilling	10	10	56/–	+6d.	3 11 5
West Riding	10	10	44/6	..	4 10 0

(*Continued on next page*)

* Dividends are paid free of Income Tax.

Company	Dividend Previous	Dividend Last	Middle Price Feb. 8	Rise or Fall	Yield p.c.
Equipment and Manufacturing					£ s. d.
Aron.Elec.Ord. ..	10	15	55/–	..	5 9 1
Assoc. Elec.:					
Ord.	10	10	51/3	+9d.	3 18 0
Pref.	8	8	38/6	..	4 3 1
AutomaticTel.&Tel.	12½	12½	58/9	+9d.	4 5 2
Babcock & Wilcox	11	11	50/–	..	4 8 0
British Aluminium	10	10	48/–	..	4 3 4
British Insul. Ord.	20	20	5½	−¼	3 15 4
British Thermostat (5/–)	18½	18½	19/–	..	4 17 4
BritishVac.Cleaner (5/–)	15	30	27/6	..	5 9 1
Brush Ord.(5/–)..	6	8	8/6	..	4 14 2
Burco (5/–) ..	15	17½	15/6	+3d.	5 13 0
Callender's ..	15	20	102/–	−6d.	3 19 0
ChlorideElec.Storage	15	15	80/–	..	3 15 0
Cole, E. K. (5/–)	10	15	26/–	..	2 17 10
Consolidated Signal	17	24	6	..	4 0 0
Cossor, A. C. (5/–)	7½*	10*	22/–	..	2 5 6
Crabtree (10/–) ..	17½	17½	38/3	..	4 11 5
Crompton Parkinson Ord. (5/–) ..	20	22½	27/–	..	4 3 4
E.M.I. (10/–) ..	6	8	27/6	..	2 17 2
Elec.Construction	10	12½	50/6	+6d.	4 19 0
EnfieldCableOrd.	12½	12½	59/–	..	4 4 8
Engish Electric .	10	10	49/9	+9d.	4 0 6
EnsignLamps(5/–)	25	15	20/–	..	3 15 0
Ericsson Tel. (5/–)	22*	20*	51/3	..	1 19 0
Ever Ready (5/–)	40	40	39/–	..	5 2 7
Falk Stadelmann	7½	7½	32/9	+3d.	4 11 7
Ferranti Pref. ..	7	7	29/6	..	4 15 0
G.E.C.:					
Pref.	6½	6½	33/–	..	3 18 9
Ord.	17½	17½	91/3	+⅛	3 16 9
Greenwood&Batley	15	15	41/3	..	7 5 9
HallTelephone(10/–)	12½	12½	25/6	..	4 18 1
Henley's (5/–) ..	20	20	25/6	..	3 18 8
4½% Pref. ..	4½	4½	23/–	..	3 18 3
Hopkinsons ..	15	17½	60/–	..	5 16 8
India Rubber Pref.	5½	5½	21/6	..	5 2 4
Intl. Combustion	30	30	6½	..	4 18 0
Johnson & Phillips	15	15	69/6	+6d.	4 6 4
LancashireDynamo	20	22½	92/–	..	4 18 6
Laurence,Scott(5/–)	12½	12½	13/–	..	4 16 2
London Elec. Wire	7½	7½	34/6	..	4 7 0
Mather & Platt..	10	10	55/–	..	3 12 9
Metal Industries(B)	5	8	44/3	..	3 12 2
Met.Elec.CablePref.	5½	5½	21/3	..	5 3 6
Murex	20	20	101/3	+⅛	3 19 0
Pye Deferred (5/–)	25	25	26/3	..	4 15 3
Revo (10/–) ..	17½	17½	38/6	..	4 11 0
Reyrolle ..	12½	12½	68/9	..	3 12 8
Siemens Ord. ..	7½	7½	33/–	..	4 11 0
Strand Elec. (5/–)	7½	10	7/9	..	6 9 0
Switchgear& Cowans (5/–) ..	10	20	18/–	..	5 11 1
T.C.C. (10/–) ..	5	5	18/9	..	2 13 4
T.C. & M. ..	10	10	51/–	+6d.	3 18 6
TelephoneMfg.(5/–)	9	9	11/–	..	4 1 10
Thorn Elec. (5/–)	20	20	22/6	+3d.	4 9 0
Tube Investments	20	20	96/–	..	4 3 4
Vactric (5/–) ..	Nil	Nil	12/9	−9d.	—
Veritys (5/–) ..	7½	7½	7/3	..	5 3 5
Vickers (10/–) ..	10	10	18/6	+1/–	5 11 3
WalsallConduits(4/–)	55	55	44/6	..	4 18 9
Ward & Goldstone (5/–)	20	20	27/–	−3d.	3 14 5
WestinghouseBrake	12½	14	70/–	..	4 0 0
West, Allen (5/–)	7½	7½	6/9	..	5 11 2

* Dividends are paid free of Income Tax.

Stocks and Shares (*Continued from page* 209)

sequence, all the mining companies which take power from the Kalgoorlie Electric have been asked to cease general mining and treatment as from Wednesday in last week.

Home Railways

The erratic character of the Home Railway market is once more illustrated by the manner in which prices, after being distinctly dull, hardened up again upon the investment of money, part of which is said to be traceable to the forthcoming repayment of the conversion 5 per cent. issue. The first dividend announcements appear this week and although it is generally expected that the rates will follow those of last February, a mild degree of interest is aroused by the possibility of an increase in the dividends paid upon junior stocks.

The Prime Minister, in the House of Commons, declined to make any statement at present as to determining any formal date on which the war will be deemed to be concluded. Mr. Churchill admitted that he saw the difficulty which has arisen by reason of the vagueness of the date at which the Government control of the railways will terminate. He added that the Courts will have to decide these matters, in the absence of special legislation by Parliament.

Radio Shares

Speculative investment continues to take a good deal of interest in the shares of the radio manufacturing companies, the attraction being, of course, post-war possibilities. In addition to these, however, the market for radio shares has been stimulated by the results of Radio Rentals. The company has declared a final dividend of 15 per cent., making 20 per cent. for the year against 10 per cent. in each of the three previous years. The profits come out at a record for the company. Radio Rentals has a subsidiary, Rentertainments, which apparently has done extremely well. Analogy cannot be too closely drawn between present-day results achieved by Radio Rentals and the possible profits which will be made by the radio companies after the war. But the anticipations of material expansion when television is once more permitted are strong enough to maintain prices of such shares as Electric & Musical Industries at a high level.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1*s.* *each) may be obtained from the Patent Office*, 25, *Southampton Buildings, London, W.C.*2.

AKT.-GES. Brown, Boveri & Cie.—" Arrangement for the automatic regulation of the compensation condition of a network by influencing the inductance of at least one arc extinction coil." 9905/42. July 23rd, 1941. (558846.)

British Thomson - Houston Co., Ltd.—" Elastic-fluid generators." 1053/43. January 23rd, 1942. (558734.) " Rheostats." 1240/43. January 28th, 1942. (558735.) " Electromagnets." 10561/42. July 30th, 1941. (558786.) " Control systems for electric welding and other circuits." 8353/42. June 19th, 1941. (558814.)

British Thomson - Houston Co., Ltd. (General Electric Co.).—" Apparatus for detecting variations in characteristic (*e.g.*, flaws) in wire or wire-like bodies." 10351. July 24th, 1942. (558785.) " Dynamo-electric machines." 13013. September 15th, 1942. (558835.)

British-Thomson-Houston Co., Ltd., and R. Newbound.—" Electrical insulating compositions." 8976. June 30th, 1942. (558816.)

Chloride Electrical Storage Co., Ltd. (C. C. White). — " Electric accumulators." 1252. January 25th, 1943. (558736.)

W. Corns.—" Electric welding apparatus." 10528. July 28th, 2194. (558802.)

General Motors Corporation.—" Distributors for magnetos for use more particularly on aircraft engines." 11557/42. August 7th, 1941. (558809.)

D. L. Hings.—" Radio receivers." 12144. August 28th, 1942. (558826.)

E. L. Holmes, A. J. Hughes and H. Hughes & Son, Ltd.—" Magnetic field indicating means." 11415. August 14th, 1942. (558807.)

Johnson, Matthey & Co., Ltd., and E. R. Box.—" Production of electrical condenser plates." 9766. July 14th, 1942. (558714.)

J. W. Meaker.—" Electrical perforation of sheet material." 12863. September 11th, 1942. (558834.)

Northern Equipment Co.—" Feed-water regulating apparatus for boilers." 10088/42. April 14th, 1942. (558821.)

Philips Lamps, Ltd. (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). —. " Magnet systems." 13722. October 24th, 1941. (558709.) " Manufacture of materials of high magnetic conductivity." 13948/43. October 24th, 1941. (Divided out of 558709.) (558738.)

Pilkington Bros., Ltd. (Soc. Anon. des Manufactures des Glaces et Produits Chimiques de Saint-Gobain, Chauny & Cirey).—" Electrical resistances." 9930. July 16th, 1942. (558756.)

Plessey Co., Ltd.—" Variable inductances." 737/43. March 19th, 1942. (558728.) " Variable inductances and contacts therefor." 738/43. March 24th, 1942. (558729.)

Rediffusion, Ltd., and G. B. Ringham.—" Telephonic apparatus." 8234. June 16th, 1942. (558749.) " Radio antennas." 9941. July 17th, 1942. (558818.)

Sperry Gyroscope Co., Inc.—" Apparatus for measuring the phase-angle between two alternating waves." 12590/42. February 13th, 1942. (558833.)

Standard Telephones & Cables, Ltd. — " Automatic telegraph exchange systems." 7306/42. May 31st, 1941. (558781.)

Standard Telephones & Cables, Ltd., and G. L. Ward.—" Electric soldering apparatus." 9963. July 17th, 1942. (558760.)

Standard Telephones & Cables, Ltd., P. K. Chatterjea and L. W. Houghton.—" Volume control in electric transmission circuits." 9958. July 17th, 1942. (558757.)

Standard Telephones & Cables, Ltd., P. K. Chatterjea and C. T. Scully.—" Circuit arrangements for resistance elements having a high resistance temperature coefficient." 9969. July 17th, 1942. (558761.)

Standard Telephones & Cables, Ltd., C. T. Scully and L. W. Houghton.—" Electrical temperature control arrangements." 9970. July 17th, 1942. (558762.)

Standard Telephones & Cables, Ltd., A. M. Thornton and W. F. Baly.—" Gain control circuits for carrier systems." 9961. July 17th, 1942. (558758.)

Standard Telephones & Cables, Ltd., B. B. Grace, J. Handley and G. Gilliver.—" Electrical measuring instruments." 9962. July 17th, 1942. (558759.) Also 18353. July 17th, 1942. (Divided out of 558759.) (558767.)

A. H. Stevens (Electronic Laboratories, Inc.).—" Electrical systems for converting direct current into alternating current." 3625. March 18th, 1942. (558791.)

Veritys, Ltd., and R. S. Blackledge.—" Self-regulating motor-generator sets." 12363. September 2nd, 1942. (558830.)

Western Electric Co., Inc.—" Amplifier circuits for photo-electric cells and like photo-sensitive devices." 922/43. October 8th, 1941. (558731.)

G. L. Woolnough and Metropolitan-Vickers Electrical Co., Ltd.—" Thermal protection of dynamo electric machines." 9795. July 14th, 1942. (558718.)

TRADE MARK APPLICATIONS

RECENT applications for British trade marks include the following, objections against which may be made within a month of February 2nd, 1944:—

ACMELITE (design). No. 623,663. Class 9. Electrical instruments and apparatus and parts thereof (none being goods included in other Classes), instrument panels for electrical instruments and apparatus, and instrument panels for indicating, measuring, and recording instruments and apparatus; all being goods wholly or principally of thermo-setting or thermo-plastic mouldable materials.—Acme Plastics, Ltd., 11/15, Goldsmith Row, Hackney Road, E.2.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Belfast.—March 7th. Electricity Department. Stores. (See this issue.)

Birkenhead.—February 14th. Electricity Department. Supply and delivery of electric lamps over a period of twelve months, commencing April 1st. Specifications and form of tender from the borough electrical engineer, Craven Street. (January 28th.)

Dundee. — February 16th. Corporation Housing Committee. Various works, including electric lighting installation, for 48 houses. Particulars from City quantity surveyor, 21 City Square.

Manchester.—March 3rd. Electricity Department. 33- and 6·6-kV switchgear at generating stations and substations. (See this issue.)

Orders Placed

Bolton.—Health Committee. Accepted. X-ray equipment for Townley's Hospital (£3,100).—Newton & Wright.

Hull.—Telephones Committee. Accepted. Cable (£343) and copper wire (£518).—British Insulated Cables.

Manchester.—Electricity Committee. Accepted. Boiler plant automatic combustion control equipment.—John Thompson Water Tube Boilers; Fire-extinguishing equipment.—Walter Kidde Co.; Ash disposal system extensions.—W. J. Jenkins & Co.; Renewal work on boiler air preheater.—J. Howden & Co. (Land); Extension of central control facilities (substations).—Standard Telephones & Cables.

Southport. — Gas Committee. Accepted. Armature for 125-kW generator (£250).—Electric Construction Co.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Bedford.—Police recreation and lecture room (£1,000); C. H. Blakeway, borough surveyor, Newnham House, Horne Lane.

Belfast.—Building, Stranmillis; secretary, Ministry of Finance, Room 103, May Street.

Bolton.—Canteen and pump house, Jethro Street; Henry Mason & Sons, Ltd.

School canteen, Monton Street, and nursery, Shaw Street; C. Herbert, borough engineer, Town Hall.

Bromsgrove.—Farm workers' houses, Warridge Hall Farm; W. Williams, New House, Elmbridge, near Bromsgrove.

Chester.—Canteen, transport depot; transport manager.

Chesterfield.—New vestries, vicarage, etc. (£3,500); Rev. J. Nobbs, St. Andrew's, Barrow Hill.

Chester-le-Street.—Hostel for pit trainees; Architect's Department, Miners' Welfare Committee, Saville Place, Newcastle-on-Tyne.

Codsall.—Village hall; A. H. Johnson, Village Hall Committee, Codsall, near Wolverhampton.

Davyhulme.—Cinema, café and ballroom on Crofts Bank; Empress (Heaton Norris) Cinema Co., Ltd., Manchester Road, Heaton Norris, Stockport.

Derbyshire.—School kitchen for Council School, Unstone; J. Harrison, county architect, St. Mary's Gate, Derby.

Dursley.—Agricultural houses at Nympsfield (£3,451); R. K. Bennett, builder, Bath.

Etruria.—Buildings for new works; Hartleys, Ltd., Kearsley Chambers, Stoke-on-Trent.

Glasgow.—Memorial houses, Curtis Street; Sir John A. Mactaggart.

Haltwhistle.—Bakery; C.W.S. Architects' Department, 90, Westmorland Road, Newcastle-on-Tyne.

Hereford.—Canteen extension, Ryelands Street Works; H. P. Bulmer & Co.

Hull.—Works additions, Somerscales Street; A. J. Blackmore, Ltd.

Leicestershire.—Canteens at 21 schools (£5,381); E. G. Fowler, county education architect, Greyfriars, Leicester.

Manchester.—Meals kitchen and dining room, Brownley Green Council School; J. B. Brez, chief surveyor, Education Offices, Deansgate, Manchester, 3.

Montgomeryshire.—Central canteen kitchen and dining room at Llanfyllin; T. G. Davies, director of education, County Education Offices, Newtown.

Morecambe and Heysham.—Two central kitchens and one dining room for school meals; R. B. Savage, borough surveyor, Town Hall.

Newcastle-on-Tyne.—Further sculleries at schools under the school feeding plan (£2,000); Contractors: Gibson Brothers, Gosforth, and A. Anderson, Ltd., Newcastle-on-Tyne.

Electricity substation; R. G. Roberts, city architect, 18, Cloth Market.

Northampton.—Factory; J. R. Routhorn.

Nottinghamshire.—Maternity unit, Mansfield Infirmary (£3,425), additions to Albany School, Stapleford (£2,000), and extensions at Rylands School, Beeston; county architect, Nottingham. Central kitchen at Fields School, Beeston (£2,025); Hofton & Son, Ltd.

Reigate.—Public library; G. G. Sanderson, borough surveyor, Town Hall.

Salford.—Canteen for 500 at Pendleton High School; W. A. Walker, city engineer, Town Hall, Bexley Square.

Saltash.—Fire station and other buildings for N.F.S.; S. C. Drabble, borough surveyor, Church House.

Sheffield.—Workshop, Norton Lane; Moore & Wright (Sheffield), Ltd., Bessamer Road.

Smethwick.—Works additions, Rolfe Street; Reliance Components, Ltd.

Works additions, Heath Street; Guest, Keen & Nettlefolds, Ltd.

South Shields.—Temporary buildings in connection with school feeding plans at St. Peter's and St. Paul's Schools, and wartime nursery at the West Park; borough engineer.

Spennymoor.—British Restaurant; U.D.C. surveyor.

Stockport.—Additional accommodation at Grammar School; secretary to governors, Davenport.

Stretford.—Offices, stores, etc., Talbot Road; Callender's Cable Construction Co., Ltd.

Sunderland.—Rigging store for Joseph L. Thompson & Sons, Ltd., shipbuilders.

Canteen at Sunderland Docks; G. T. Brown & Son, Fawcett Street.

Swinton.—Extensions to Grosvenor Road Council School, and school canteen; A. Cordwell, borough surveyor, Town Hall.

Walkden.—Central kitchen, Senior Council School site (£4,192); G. & J. Seddon, Ltd., builders, 5, Manchester Road, West Little Hulton, near Bolton.

Wallsend.—Addition to offices; Wallsend Slipway & Engineering Co., Ltd.

West Hartlepool.—Dining centres at Newburn and St. Cuthbert's Schools; borough engineer.

Seamen's Mission Institute (£4,000); Rev. J. A. Fulton.

York.—Extensions to Holgate's Grammar School; governors.

Extensions and alterations for administrative block, Acomb Maternity Hospital; flats for old people, city centre; C. J. Minter, city surveyor, Guildhall, York.

Workshop, Fawcett Street; Teasdale & Metcalfe, Ltd.

Forthcoming Events

Institution of Electrical Engineers.—Monday, February 21st, 5.30 p.m. Informal discussion on "The Use of Electricity in the Equipment and Testing of Aircraft," to be opened by Mr. C. G. A. Woodford (Ministry of Aircraft Production).

Wireless Section.—Tuesday, February 15th, 5.30 p.m. Discussion on "Recording and Reproduction of Sound," to be opened by Dr. G. F. Dutton.

Measurements Section.—Friday, February 18th, 5.30 p.m. "A Modern Earth-Fault Relay Equipment for Use on Systems Protected by Petersen Coils," by Messrs. L. B. S. Golds and C. L. Lipman. Joint meeting with Transmission Section.

North-Eastern Centre.—Monday, February 14th, 6.15 p.m. Neville Hall, Westgate Road, Newcastle-on-Tyne. "University Education and Industrial Training of Telecommunication Engineers," by Prof. Willis Jackson.

North Western Centre.—Saturday, February 19th, 2.30 p.m. Engineers' Club, Manchester. Informal discussion on "Post-war Planning for Improvement in Electricity Supply," to be introduced by Mr. W. Fennell.

West Wales (Swansea) Sub-Centre.—Saturday, February 19th. "Bonded Deposits on Economiser Heating Surfaces," by Messrs. J. R. Rylands and J. R. Jenkinson.

Mersey and North Wales (Liverpool) Centre.—Monday, February 21st, 5.30 p.m. Liverpool Royal Institution, Colquitt Street. "Waves Guides in Electrical Communication," by Mr. J. Kemp.

Devon and Cornwall Sub-Centre.—Thursday, February 24th, 3.30 p.m. Globe Hotel, Courtenay Street, Newton Abbot. "Protective Systems for Rural Distribution up to 33 kV," by Messrs. R. W. Steel and A. W. Allwood, B.Sc.

North Midland Students' Section.—Saturday, February 12th, 2.30 p.m. Griffin Hotel, Leeds. "Music Channels in Telephone Cables," by Mr. A. C. Holmes.

South Midland Students' Section.—Tuesday, February 15th, 6.30 p.m. James Watt Memorial Institute, Birmingham. "Modulation," by Mr. G. L. Benbow, B.Sc. (Eng.).

Association of Supervising Electrical Engineers.—Saturday, February 12th, 2.15 p.m. Lighting Service Bureau, 2, Savoy Hill, London, W.C.2. Illustrated lecture on "Remote Control Equipment and Operation," by Mr. A. T. Crawford, B.Sc., A.M.I.E.E.

Association of Mining Electrical and Mechanical Engineers.—*West of Scotland Branch.*—Saturday, February 12th. Discussion on the 1942 report of the Electrical Inspector of Mines.

South Wales Branch.—Saturday, February 19th. Crumlin. "Brains Trust."

Junior Institution of Engineers.—Friday, February 18th, 6.15 p.m. 39, Victoria Street, S.W.1. "Industrial Infra-Red Heating," by Mr. A. C. F. Mackadam.

Derby Society of Engineers.—Monday, February 14th, 6.30 p.m. School of Arts Lecture Theatre, Green Lane. "Plastics," by Mr. M. Apley.

Illuminating Engineering Society.—Monday, February 14th, 5 p.m. Royal Institution, Albemarle Street, London, W.1. Address by the president, Dr. H. Buckley, on "Some Eighteenth Century Contributions to Photometry and Illuminating Engineering."

British Institution of Radio Engineers.—*London Section.*—Wednesday, February 16th, 6.30 p.m. Institution of Structural Engineers, 11, Upper Belgrave Street, S.W.1. Discussion on "Television Standards," to be opened by Messrs. L. H. Bedford, O.B.E., and W. A. Beatty.

Institute of Fuel.—*Birmingham.*—Wednesday, February 16th, 2.30 p.m. James Watt Memorial Institute. Informal discussion on "Mechanical Draught Applied to Steam Boilers."

Women's Engineering Society.—*Manchester Branch.*—Thursday, February 17th, 6.30 p.m. Engineers' Club, Albert Square. "Light and Lamps," by Mr. A. Owen.

Institution of Mechanical Engineers.—Friday, February 18th, 5 p.m. Annual general meeting and paper on "Fencing of Dangerous Parts of Machinery," by Mr. H. A. Hepburn.